

CHALLENGES OF TEACHING UPPER PRIMARY MATHEMATICS: A CASE STUDY  
OF MOGODITSHANE PRIMARY SCHOOLS



By

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## APPROVAL

This research essay has been examined and approved as meeting the required standards of scholarship for partial fulfilment of the requirement for the Master of Education Degree (Mathematics Education).

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## STATEMENT OF ORIGINALITY

I declare that the research essay titled ‘Challenges of teaching upper primary mathematics: A case study of Mogoditshane primary schools’ was completed by the author at the University of Botswana between March, 2017 and October, 2019. It is original work except where reference is made and neither has it been nor will it be submitted for the award of any other degree of any other university.

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Student

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Date

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## ABSTRACT

Learners in upper primary classes require an education in mathematics which is useful, exciting, engaging and fun so as to enjoy and appreciate the subject. This is a significant challenge to today's mathematics teachers who experience major challenges not only in the mathematics content but also in the way they teach. To meet these challenges, teachers need commitment, educational support and encouragement of leaders at all levels. This study sets out to identify the challenges that teachers and learners encounter in the teaching and learning of upper primary mathematics in Botswana (Kweneng) in Mogoditshane primary schools. A mixed-methods approach (a triangulation method) was used to collect data from teachers and students. Questionnaires and interview guides for both teachers and learners were used to collect data. Stratified random sampling procedure was used for sampling participants for the study. The challenges found included; lack of resources, packed syllabus objectives, high teacher-learner ratio, lack of parental involvement, inappropriate teaching and learning of mathematics, limited in-service education for teachers as well as insufficient use of technology by both teachers and learners in mathematics. The findings of the study have contributed in identifying some recommendations on how to address challenges that teachers and learners encounter during teaching and learning processes of upper primary mathematics.

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## LIST OF ABBREVIATIONS AND ACRONYMS

BEC	Botswana Examination Council
DMSE	Department of Mathematics and Science Education
ME&SD	Ministry of Education Skills and Development
NCE	National Commission on Education.
NMAP	National Mathematics Advisory Panel
PMS	Performance Management System
PISA	Programme for International Student Assessment
PTA	Parents and Teachers Association
SPSS	Statistical Package for Social Sciences
TT&D	Teacher Training and Development
TIMSS	Trends in International Mathematics and Science Studies

## CHAPTER ONE

### INTRODUCTION

This chapter introduces the study on challenges of teaching upper primary mathematics; a case study of Mogoditshane primary schools in Botswana. It presents background of the study, a theoretical framework and the statement of the problem. It is followed by; purpose of study, research objectives, research questions and significant of study. The chapter further highlights the limitation of study, delimitation of study and definition of key terms used. The final section provides the outline of chapters.

#### 1.1 Background of the Study

Mathematics is one of the most important school subjects in the curriculum in Botswana. It is a compulsory subject in primary and secondary schools. It is the language of science, the foundation of engineering and the power switch of all technology. Mathematics is a subject that has direct relationship with other subjects particularly technical and sciences (Sparks, 2011). It is the study of quantity, structure, space and change. Mathematics seeks out patterns, formulate new conjectures and establish truth by vigorous deduction from appropriately chosen axioms and definitions (Zieger, 2010).

The definition above shows that mathematics is the basic foundation for day to day living. Tshabalala and Ncube (2012) argued that mathematics is a bed rock and indispensable tool for scientific technological and economic developments of any nation. Therefore, mathematics is a subject that education and human life cannot function effectively without.

Even though mathematics is an important subject, poor performance in mathematics has been reported in many countries, including the developed world (Bertz & Zamfirescu, 2000). In developing countries, Botswana is one of the countries experiencing unsatisfactory results in mathematics. Botswana Examination Council (BEC) (2016) recorded that since 2013 there has been a slight increase of upper primary mathematics performance in Primary School Leaving Examinations (PSLE).

Fraser (1992) pointed out that school environment at primary school level is very poor and non-conducive for learning. It is of paramount importance to find out in this research what exactly lowers the performance of learners in mathematics and what is expected to have a positive impact on students' academic achievement and the success of the school (Christie & Martin, 2005).

General education instruction in mathematics focused a great deal on advanced concepts and reasoning such as explaining terms or topics which seem to be challenging to learners but still mathematics results are not satisfying. From standard five classes, automatic recall of number facts is well-developed in most normally-achieving youngsters. This does not give value in mathematics performance and hence the proposed study to find out the challenges teachers and learners could be facing. There are many excuses that are cast when we see students fail. This is emphasized by Mphale (2014) who stated that teachers for years have been regarded as the essential catalysts for school improvement. They are the driving force and main resource in the development and academic growth of students as they are sources of knowledge and agents of change (Jung, Hartman, Smith, & Wallace, 2013). Teacher effectiveness has been the interest of policy makers, educators and parents. The effectiveness is measured by students' academic performance in both internal and external examination. Mathematics is allocated more teaching

hours than other subjects such as Agriculture, Setswana, English and Social Studies as stated in the Botswana primary school syllabus (standard 5-7). It is allocated three and half hours in a week as compared to other subjects such as religious and moral education and social studies but still mathematics performance is not satisfying. Therefore, it is against this background that this study establishes the challenges teachers encounter as they teach upper primary mathematics in Mogoditshane primary schools.

## 1.2 Theoretical Framework

The study was guided by theories and concepts which commonly discuss performance in the teaching and learning field. Specifically the study was guided by: constructivism, critical pedagogy as suggested by Giroux (1997); Attribution theory; Hull theory; and System theory.

The study was guided by the constructivism theory which deals with helping teachers in having knowledge and skills in the teaching of mathematics. In constructivism theory, learners are given the chance to probe questions, develop answers and interpret the learning environment and the teacher's target is to give learners feedback which acts as intrinsic motivation to learners. The primary school assessment measures follow the constructivism view of learning which uses the standard based assessment procedure which provides more informative evaluation of each learner performance compared to the previous norm- referred grading assessment procedure in the final examination which only focused on grading learners performance against others. (BEC, 2015).

Constructivism theory helps teachers to identify what learners know and assess them on what they are best at, which will enable learners to raise their own questions, helping them in learning. Noddings (1990) states that constructivism theory deals with cognitive and

methodological aspects by stating that, as a methodological perspective, constructivism assumes that human behavior is purposive and has the capacity to organize knowledge gained.

Giroux's (1997) critical pedagogy of learning stated that both teachers and learners must be active co-participants in the teaching and learning process. Giroux has been an important contributor to a variety of academic fields such as critical pedagogy. Giroux has been in the forefront of efforts in developing a critical theory and practice of education applicable to conditions in contemporary education. Giroux's theory helps in exposing schools as sorting and tracking institutions that treat and teach in ways which are different from their middle and upper class counterparts (Bruno, 1990). This implies that the theory compares schools which perform better to those which do not and find out ways of helping those who are not performing well. Bruno explained that all learners should be grouped according to their perceived ability so as to provide them with a level of curriculum that is appropriate to their needs. Giroux suggests that educators should use their own pedagogical assumptions about knowledge, achievement and teacher-student relations.

The study is also guided by attribution theory by Malle and Korman (2013) who stated that performance is just like a test which could be attributed to lack of hard work. The theory predicts the behaviour of students depending on their responses as the theory is concerned with the 'how' 'why' and the 'what' by which people process information in attempting to understand events (Weiner, 2005). Weiner 2005 stated that students learning are affected by environmental factors such as student home or school. Weiner also mentioned that teachers need to know that they can affect learners' performance through their comments to learners.

The research also relies on the Hull theory of Clark-Hull (2014) which indicates that learning depends on several factors. The Hull theory sought to explain learning and motivation

by scientific laws of behaviour. This theory consisted of many postulants which are stated in mathematical form. The factors include the number of previously rewarded experiences, the internal drive of the learner and the external incentives given to the learner contribute to how learners will perform in mathematics.

The research also depends on the systems approach theory by Ludwig von Bertalanffy. The system approach is based on viewing problems than a school management thought. The system is also based on the concept that an organization is a system. The system theory is the transdisciplinary study of the abstract organization of phenomena, independent of their substance, type or spatial of existence (usually of mathematics) models which can be used to describe them (Heylighen & Joslyn, 1992). The system approach explains the importance of interdependence and interconnectedness of people in a group as they contribute to a specific system while trying to achieve a common goal. The system approach theory is very vital in this research as the researcher believes that there are interdependence and interconnectedness among the students, teachers and the school results in outstanding performance in mathematics.

Teaching of mathematics must be done in a way that allows learners to explore what they are being taught. Ary, Jacobs, Sorensen and Razavieh (2010) stated that, “the mixed method approach favours philosophical school of thought called pragmatism. Pragmatism focuses on what works to answer the research question” (p. 87). Pragmatism is also viewed as a philosophy that invites deep commitment to practice (Kalolo, 2015). Pragmatists see their action as driven by dialectics, a process of arriving at the truth through confrontation of different points of view. Pragmatism has been considered to be a useful lens that can help in understanding debates and discourses in complex situations (Dewey, 1956; Mead, Trohler & Oelkers, 2005). According to Arif, Smiley and Kulonda (2005), pragmatism is also related to instrumentalism as propounded



by John Dewey and it is related to real-world applications of knowledge and skills attained by learners as a product of schooling (Dewey, 1973). Pragmatism is also based on progressivism where value is placed on knowledge that is useful for survival (Reed & Johnson, 2000). An ideal teacher has the highest degree of integrity and is responsible for the adaptation or modification.

Mathematics performance by students has persistently been poor in Botswana schools. Performance is the accomplishment of a given task measured against present known standards of accuracy, completeness cost and speed. This study sought to establish the challenges contributing to the poor performance and to establish the strategies that can be adopted to improve the standard performance in mathematics by students in upper primary mathematics. The challenges that have been identified in other studies include understaffing, inadequate teaching materials, lack of motivation and poor attitudes by both teachers and students and the role played by parents in their children's education. The study therefore aims to identify the challenges that play out prominently in Mogoditshane schools. The study would also be a guidepost that would help parents, teachers, learners and policy makers to identify their area of strength and weaknesses and make necessary adjustments to fill the gaps in their roles. The study will also go a long way in generating much needed information that would be used by various stakeholders in education to improve on the quality of education of their children. The study will also help future researchers who have the quest for improving education for all learners in primary schools in Botswana.

### 1.3 Statement of the Problem

Providing education for all is one of Botswana's national goals. While the country claims to have achieved hundred percent (100%) universal access to basic education, there is evidence

of some children who complete both primary and secondary education without having grasped the basic concepts of numeracy, literacy, general knowledge and life skills (Damane & Molutsi, 2013). This poor performance is of immense concern to teachers because their status is being threatened with the poor performance of the students since teachers' promotions are based on how learners perform. The parents also feel much worried because of the non-realization of their hopes on their children.

The school administrators and administrative skills are also brought to question with the poor performances of the students while the government is equally disillusioned because the students' performance does not justify the huge expense on education. The Ministry of Education gets the highest priority and largest share of the total ministerial recurrent budget (Matlala & Wessells, 2015). Moreover, some money is spent in buying stationary and textbooks. In addition, the government pays teachers' salaries. Despite Government efforts to improve the quality of teaching and learning and general education in Botswana primary schools, the decline in performance and challenges still persist in upper primary schools especially in mathematics. There are many factors that can influence performance in mathematics. Among these are challenges faced by teachers and students. Therefore, it is on the basis of these factors that the researcher decided to undertake this study so as to find out the challenges of teaching upper primary mathematics that contribute to poor performance in Mogoditshane. The study was designed to establish challenges encountered in Mogoditshane primary schools.

#### 1.4 Purpose of the Study

The purpose of the study was to establish challenges of both learners and teachers in the teaching and learning of mathematics at upper primary school level in Mogoditshane (Kweneng)

primary schools in Botswana. The study also identified the strategies teachers and learners use to address the challenges they encounter in teaching and learning upper primary mathematics.

### 1.5 Research Objectives

Specific objectives of the study were to:

1. Identify challenges encountered by both teachers and learners in upper primary mathematics.
2. Determine the impact of challenges on performance in upper primary mathematics.

### 1.6 Research Questions

The study addressed the following questions:

1. What are upper primary teachers' challenges in teaching mathematics?
2. What challenges do learners encounter as they learn mathematics?

### 1.7 Significance of the Study

The findings of this study would shed light on how to achieve quality education in comparable schools in the department of primary in the Ministry of Basic Education. The study might also provide insight into the problems whose solution might help inform specific actions to be taken to efficiently and effectively address the poor performance in mathematics in schools.

The study will also provide strategies to guide teachers on how to improve performance of learners to a level that would allow them entrance in secondary level. The study will also provide pointers to staff development opportunities that assist teachers in developing teaching methods which are proven to be effective with today's students. The outcome of the study will provide

pointers of agenda of staff development activities that would assist teachers in developing teaching and learning strategies. Methodologies adopted in this study can be used to create knowledge that can be applied to real life situations. It will also shed light on the challenges which teachers and learners encounter in teaching and learning of mathematics in upper primary and suggest strategies of dealing with such challenges. The study will also go a long way to influence teaching and learning policy in the teaching of mathematics in primary schools as well as to strengthen in-service support by the Department of Teacher Training and Development (TT&D). The study will also be useful to planners, educators, administrators and other educational stakeholders to build awareness to students and teachers of Botswana on challenges affecting teaching and learning of mathematics. Change of attitude in both the students and teachers will help improve performance in mathematics. Lastly, the study will strengthen the relationship of teachers and learners with school supervisors by providing an agenda for inspection audits in terms of teaching strategies for mathematics. It will benefit mathematics educators, learners and the nation in general.

### 1.8 Limitations of the Study

The study was limited by time and sample size. It was difficult to cover a large population due to the limited time allocated for the research. The sample was drawn from the four primary schools in Mogoditshane. Questionnaires were also a limitation since response from the teachers and students might not have been 100% accurate.

## 1.9 Delimitations of the Study

The study was delimited to standard five, six and seven classes in four primary schools in Mogoditshane, Kweneng district. This was done because there is need to conduct a research to establish the challenges that cause the poor performance in mathematics in Mogoditshane primary schools. The study involved only standard five, six and seven class teachers and three learners from each standard.

## 1.10 Definition of Key Terms

Mathematics - is the study of quantity, structure, space relation, change and various topics of pattern form and entity. (Hersh, 1998).

Teaching methods – this is the principles and methods used for instruction. Teaching methods are also general principles, pedagogy and management strategies used for classroom instruction. Examples of teaching methods are lecture method, class participation, demonstration method, project method and many more.

Performance - Accomplishing or achievement of specific goals, objectives or set mark in any academic endeavor. It is one of the most common criteria of evaluating effectiveness of schools.

Teaching strategies - are a combination of instructional methods, learning activities and materials that actively engage students. They appropriately reflect both learning goals and students' developmental needs.

## 1.11 Outline of Chapters

Chapter one gives the context of the study describing the introduction of the study, the background of the study, the theoretical framework, the statement of the problem, purpose of study, the research questions, the significance of the study, limitations, delimitations, definition of terms and the outline of chapters.

In chapter two, literature review is presented. The literature is based on the main themes of the study; mathematics performance in schools, mathematics performance in Botswana, the challenges that affect teaching of mathematics in upper primary, and strategies that teachers employ in solving challenges they face when teaching upper primary mathematics. The chapter ends with a summary of the reviewed literature.

Chapter three focuses on the methods used in the study including research design, population of the study, sample and sampling procedures, research instrumentation, selection methods, data collection instruments, data collection procedure, validity and reliability of instruments, data processing and analysis and ethical issues considered in the study.

In chapter four, collected data is systematically organized, analyzed and the findings presented and discussed. Finally, chapter five outlines the summary, the conclusions and recommendations based on the finding

## CHAPTER TWO

### LITERATURE REVIEW

#### 2.0 Introduction

This chapter presents a review of literature relevant to the study on challenges of teaching upper primary mathematics. The chapter organized into five sections: mathematics performance in schools; mathematics performance in Botswana; challenges that affect teaching of mathematics in primary; strategies teachers employ in solving challenges they face when teaching upper primary mathematics and summary of literature review. The topic under study is challenges of teaching upper (standard 5, 6 and 7) primary mathematics in Botswana. This chapter is based on giving out detailed or specified knowledge about the topic being researched as well as to obtain concrete data about the problem. Literature also provides the researcher with the opportunity to identify previous similar studies that have been conducted.

#### 2.1 Mathematics Performance in Schools

Globally studies have shown that performance in mathematics in primary and secondary schools is declining, Botswana inclusive (Spring, 2008; Tyler, Taylor, Kane & Wooden, 2010). Developed nations like the United States of America, who spend relatively high amount of funds per student, have recorded poor performance in mathematics (PISA, 2012). Spring has also found that, “South Africa performs poorly on international assessment of mathematics. Learner performance has not been improved both at primary and secondary levels from 2001 to 2011” (p. 65). This is also emphasized by Taylor and Tyler (2011) by stating that, “Many schools in South Africa are plagued by poor time management practices at school and classroom levels, poor teacher knowledge of the subject they are teaching” (p. 123). The authors further posit that,

“many schools, average scores are disappointingly low and indicate that many students are failing to learn hence contributing to poor performance in mathematics” (p. 145). Studies have shown that mathematics performance is enhanced by several factors which include mastering of mathematical language (Foster, 2007), competency in mathematics teaching (Goddard & Melville, 2004; Sa’ad, Adamu, & Sadiq, 2002), school learning environment (Ojimba, 2012; PISA, 2012), availability of resources and appropriate teaching aids (Kelly & Lesh, 2012).

Foster (2007) observed that, “Chinese school teachers engage their students to find examples of where mathematical concept being learnt is active in their daily life or in popular culture” (p. 76). This method connects students to learn mathematics in a deeper way than simple utilization of understanding. It also gives the teachers insight into the lives of their students. This increases high performance in mathematics which is needed nationally. Learners encounter many problems when learning mathematics because some of their teachers do not have the subject matter knowledge and this forces them to make learners to memorize symbols and rules. This in turn contributes to poor performance in mathematics as learners tend to forget what they have memorized when they get in the examination room. Memorizing is not learning. Foster further noted that, “When we memorize rules for moving symbols around on paper we may be learning, but we are not learning mathematics. Moreover, the use of symbols without understanding cannot develop students’ relational understanding of algebra” (p. 164). Foster highlighted that learners are taught abstract ideas without meaning, this might not develop their understanding in mathematics. He suggested that teachers must give learners deep understanding of mathematics. Children should be aware of what they are learning and how knowing sound-symbol correspondences will help them become better learners. This shows that the use of symbols



without an understanding cannot develop learner's conceptual understanding of mathematical concepts hence contributing to poor performance in mathematics. This issue is supported by,

Blanton and Kaput (2004) stating that, "a very young child's ability is to describe relationship and found evidence for co-variation reasoning or keeping track on how one variable changes with respect to one another" (p 13). This would be done using the phonic chart which highly helps because learners who sometimes fail because they cannot understand the instruction of a question. This therefore make learners to guess when doing their work rather than doing what is required and this will lead to poor performance. Blanton and Kaput mentioned that leaners need to be taught adequately so that they would perform better in their studies.

Shannon and Bylsma (2007) emphasized that, "for learners to understand the concepts and basics of mathematics, letters used in mathematics, index or a sign used in mathematics, the place value that an actual number represents should be considered as potential for learners, and this on its own contribute much on the performance of mathematics" (p. 123). Learners will then understand mathematics because there will be an understanding of the language used in mathematics. Halfield, Edwards and Bitter (1997) suggested that, "for the performance of mathematics to be efficient and effective, children must be taken through their degrees of abstraction from manipulative of symbols to level them nicely from pure arithmetic level with concrete manipulative to abstract knowledge in symbolic notation" (p. 12). Teachers need to access quality professional development in mathematical concepts in order to deepen their own understanding of the mathematical content. Halfield et al. (1997) further argued that there must be a conduction of an activity in which children start from simple to complex variables where the relationship is mostly emphasized hence improving the performance of mathematics.

Foster (2007) also supports the idea that learners must be taught from simple to complex by stating that, “if learners are taught abstract ideas without meaning, this might not develop their understanding but rather make them to hate mathematics and think that it is a difficult subject” (p. 78). Children must be taught in such a way that they understand the concept better. The National Mathematics Advisory Panel (NMAP) (2007) also share the same sentiments by stating that, “students need to develop understanding of concepts, problem solving skills and conceptual skills related to mathematical concepts” (p. 127). According to Motshekga (2016), South Africa is also experiencing significant underperformance in education, particularly in mathematics teaching and learning. Motshekga found it of paramount importance to make a set of values for the teaching and learning of Mathematics in the South African context. In 2011, the Trends in International Mathematics and Science Study (TIMSS) show that South African learners had the lowest performance among all the 21 middle-income countries that participated. This has been attributed to a number of factors, such as low parental involvement and lack of community participation in education. TIMSS (2015) suggested that there is need to analyze the patterns, cause and effects of poor learner outcomes in the South African context. TIMSS also suggested that there should be enough textbooks for pupils as well as to encourage learners to have positive attitude towards school.

In Japan, learners perform better in mathematics. Mathematical thinking, which is regarded as an educational value, has been continuously and widely developed by the Japanese. Some of its objectives were to help students to grasp basic concepts and principles about numbers as well as to let them develop more advanced mathematics thinking. Japanese elementary mathematics teaching describes carefully implemented practices that are passed on from experienced to novice teachers through extensive apprenticeships. Mathematics lessons begin slowly and build

methodically in an attempt to engage students in a challenging problem (Woodward & Ono, 2004).

Mathematics in Singapore is not about knowing everything but rather how to think like a mathematician. Singapore teachers use the whole class approach which allows teachers to spot weaknesses and intervene swiftly if a child needs help rather than waiting for them to get stuck on a problem and calling for attention (Vasagar, 2016).

Maxwell (2016) mentioned that the poor performance in Ghana is caused by laziness, lack of interest, tutors attitude, indiscipline, lack of confidence and poor mathematics background from the previous standards. Maxwell therefore recommended that, student should try their best such that they can avoid much of these in their academic life. They should also identify their weaknesses and work at it effectively to achieve results. However they also recommended that at this level students should not rely on friends, colleagues or tutors' so much, but rather create the habit of reading conceptually and learn on their own with small guidance from people who are ahead of them in the area of studies (Maxwell, 2016).

#### 2.1.1 Mathematics performance in Botswana

The Government of Botswana has since attaining independence from Britain in 1966 demonstrated a lot of interest in the improvement of primary education by adopting two policies; the Education for Kagisano of 1977 and the Revised National Policy on Education of 1994 to guide the development of education in the country. Other efforts include partnering with organizations from other countries such as the USA and Britain and others to help improve the quality of the primary education. The other major aim for these was to improve the performance of learners in mathematics. Provision of quality education is a priority that every country will

aspire to include amongst the national goals of education. Raising the standard of education is one of Botswana's national goals (Ministry of Education, 1994).

One of the goals in Botswana primary education is to develop basic skills of literacy, numeracy, and life skills among learners. Despite the goals, mathematics performance in primary education still record poor results. There are factors that are attributed to poor performance in mathematics in Botswana. According to Mapolelo (2001), poor performance in mathematics in Botswana is caused by the use of English language as a medium of instruction. The author further mentioned that the complex phrases combining more than one concept such as “least common multiple” makes learners to fail mathematics because they do not understand the language used. Mapolelo also mentioned that the multilingual and socio-economic diverse society of Botswana contributes to poor performance of mathematics as some students are not familiar with the English language used in mathematics context. Benson (2005) highlights that children's home language should be used to teach them as they will understand concepts better. Matang (2003) indicated that for children to gain interest in mathematics and make a meaning out of what they are learning, their culture needs to be embedded in mathematics. Matang further emphasized that materials from children's background needs to be used as teaching aids to make more meaning to mathematics concepts and ideas taught. Conceptual meaning of ideas needs to be provided in mathematics through culturally inclusive curriculum.

Learners' first or home language plays a significant role in the learning of the second language in terms of cognitive, linguistic and socio-cultural influences. Cummings (2000) emphasized that ways of incorporating the use of learners' home language into mathematics lessons. Strategies to be used include learners working with same language partners for some of the time; inviting parents to participate in mathematics lessons from time to time; working with

bilingual dictionaries and other resources. Mokotedi (2013) mentioned that in recent years, there have been a number of innovations and reforms aimed at making education relevant to the needs of the society. Despite the premium placed on education, there continue to be challenging and persistent issues negatively affecting teacher education. Teachers in primary schools are challenged by the generalist approach of teaching whereby teachers teach all subjects in the curriculum. The generalist approach makes learners to perform badly in mathematics.

Report of National Commission on Education (NCE) (1993) also analyzed performance in mathematics and concluded that mathematics in Botswana is in a “parlous state.” Matsoga (2003) mentioned that, on average, about 22.9% of girls passed mathematics from 2000-2005, while about 24% of their male counterparts passed the same subject over the same period of time.

Performance in mathematics by Botswana Examination Council in 2016 showed a decline in all upper grades and the most affected was the C grade where a decrease of 0.67% from 37.25% in 2015 has been recorded (Botswana Examination Council, 2016). The proportion of candidates at grade D has decreased by 1.18% from 23.27% (2015) to 22.09% (2016). Grades E had increase of 0.49% from 6.81% (2015) to 7.30% in (2016). Grade E shows that there was a decline in mathematics in 2016.

## 2.2 Challenges that Affect Teaching of Mathematics in Upper Primary

There are many challenges that affect mathematics in upper primary among them is the limited time given to teaching of mathematics. Time is seen as the most credible aspect of life. There is not enough time to teach mathematics as only three and half hours are given to mathematics teaching and learning in the syllabus in a week which is not enough. There is inadequate student or teacher contact time for mathematics and these hinder teachers' and

learners' efforts to improvise using available mathematics textbooks and past test papers. It has also been found out that to use past exam papers for learning and teaching purposes require enough time to discuss certain topics which seem difficult. Mathematics needs more time particularly double periods for the subject to succeed. Countries such as China perform very well in mathematics because the subject is given more time. Wei (2014) states that mathematics lessons' time increased from forty minutes to 45 minutes per lesson every day for primary pupils which makes learners to spend more than fifteen hours per week on mathematics both in and outside the classroom. Botswana lesson is thirty minutes per single lesson and there are eight lessons in a week. The time allocated for Botswana primary mathematics as compared to that of China is insufficient which causes poor performance in upper primary mathematics.

Other challenges include lack of teacher confidence and lack of teacher competence in teaching mathematics and negative attitudes towards mathematics. It is of paramount importance upon education authorities to provide teachers with all the necessary tools that could enhance their teaching profession effectively and efficiently. Teacher education institutions have always been blamed for producing 'not well trained' teachers. Rama (2003) stated that, "Teacher education neither addresses the reality that one faces when one begins their career nor presents issues of quality. Most of the programs require the teacher trainees to spend a prescribed number of hours each day on different subjects and to follow textbooks in a prescribed sequence-jumping from one chapter to the other within days in a way that does not really make any sense...overall, our teacher education contributes nothing in developing a good teacher" (p. 1). One may wonder what a good teacher education program is. Darling-Hammond (2006) noted that teacher

education should consist of a “tight coherence and integration among courses and between course work and clinical work using pedagogies that link theory and practice” (p. 300).

This means teacher education should help student teachers apply the theories to teaching practice in classroom settings. According to Darling-Hammond, one of the components that can make a good teacher is to have “extended clinical experiences at least thirty weeks of supervised practicum and student teaching opportunities in each program” (p. 305).

Darling-Hammond further noted that:

The most powerful programs require students to spend extensive time in the field throughout the entire program, examining and applying the concepts and strategies. Such programs typically require at least a full academic year of student teaching under the direct supervision of one or more teachers who model expert practice with students who have a wide range of learning needs with the candidate gradually assuming more independent responsibility for teaching. This allows prospective teachers to grow “roots” on their practice, which is especially important if they are going to learn to teach in learner-centred ways that require diagnosis, intensive assessment and planning to adapt to learners’ needs, and a complex repertoire of practice judiciously applied. (p. 307).

It is of paramount importance for teachers to be well trained in the teaching and learning of mathematics so that they will be able to teach with confidence. Effective professional development enables educators to develop the knowledge and skills they need to address students' learning challenges. Professional development is not effective unless it causes teachers to improve their instruction to become better teachers. Continuing professional development is important because it ensures that teachers continue to be competent in their profession. It is an ongoing process and continues throughout a professional's career. Miller and Liesveld (2005)

points out that great teachers help create great students. In fact, research shows that an inspiring and informed teacher is the most important school-related factor influencing student achievement, so it is critical to pay close attention to how we train and support both new and experienced educators. Kelly (2017) expresses that, training teachers helps to provide new teachers with the greatest chance needed to have completed a teacher preparation program that provides them with knowledge, experience and guidance. When this does not happen, we not only risk teachers leaving the profession quickly, but more importantly, we risk the education of entire classes of students.

Korhonen, Linnanmaki and Aunio (2012) state that there is a link between students' mathematics achievement and proficiency in the language of instruction. Low mathematical achievement has been found to be linked with incompetency in the language of instruction. Students who are taught mathematics in the second language struggle. Kim, Ferrini-Mundy and Sfard (2012), stated that language affects students learning in mathematics. The mathematical discourse of English speakers on infinity was procedural. The Korean speakers discourse was more formally mathematical and structural.

Nunan (2012) was of the view that if children are not able to formulate the rules of grammar which they use, they will not be able to understand what they have been asked to do. Nunan further mentioned that children need to understand the language so that they will be able to focus on what they have been tasked to do. A study on teachers' strategies in teaching mathematics using a second language in primary schools was conducted by Kasule and Mapolelo (2005) in Botswana. The study revealed that teaching primary mathematics using a language which is not familiar to those in the classroom or is not their mother tongue is a great contributor to having difficulties in learning mathematics. Teachers devised suggestions such as code



switching from English to Setswana, using Basic English language where possible and encouraging learners to speak English.

Teachers must also be engaged in large numbers in curriculum development. This would help teachers have an opportunity to discuss how certain concepts or methods will affect students in their local areas. Taylor, Swinnerton, Tait and Threlfall (2004) mentioned that for teaching and learning to be effective, teacher participation in curriculum development is of paramount importance as it will bring in local experience from various areas or locations and this enriches the curriculum.

Barwell (2003) corroborates with Kasule and Mapolelo (2005) that internationally, English is the main language in countries such as USA and UK. Barwell advocates that there is need to accommodate learners whom English is not their mother tongue. Having learners accommodated, learning will be easy to those whom English is not their mother tongue. Another study was conducted by Yaomingxin Lu (2016) who stated that Chinese students perform better in solving geometry problems as compared with their American peers.

### 2.3 Summary

Mathematics procedures need to be practiced to make the subject more valuable to learners. Lack of motivation in mathematics to learners has been proven as a great barrier in upper primary mathematics. A study by Kasten and Sinclair (2009) has shown a strong correlation between lack of motivation and rising numbers of a risk student in mathematics. All students learn at different paces, and particularly among young people. Since students in a class differ and have different perspectives such as level of mastery, economic background, cultural background etc., each student should be treated according to their individual needs. Mathematics must be

taught passionately as students are not only taught to be mathematicians but also to work in different work places because mathematics is used in everyday life situations. Learners who are taught by teachers who are not competent with mathematics have severe consequences for a nation's overall productivity. The literature has pointed out that learners' performance is really based on the way they are being taught. Mathematics is a very important subject which provides a foundation for all other academic disciplines. Poor performance in mathematics is not only a local phenomenon but a global one as well. Drivers that influence performance are both learner and teacher centred. Performance in mathematics is influenced by various challenges, which include teaching methods, proficiency in English Language as a medium of instruction, teacher confidence and competency.

The review of literature identified key challenges which drive or influence students' performance in mathematics. However, the studies that were reviewed did not reveal which among the student and the teacher related factors are the most important. This study therefore attempts to confirm and rank the most important challenges contributing to poor mathematics performance in upper primary in Botswana. Key challenges that will be considered are language, teacher experience, teaching strategies, subject specialization, resources, time and teacher-learners' ratio. This study will therefore bring in new insight to solve challenges contributing to poor performance in upper primary mathematics. This study will further contribute towards the development of informed interventions that will target specific learner and teacher related challenges with the hope of improving mathematics performance in upper primary.

## CHAPTER THREE

### METHODOLOGY

#### 3.0 Introduction

This chapter outlines the research methodology as well as techniques that were used in data collection. The case study was designed to establish challenges of both students and teachers in the teaching and learning of mathematics at upper primary in the Kweneng region in Botswana. The case study identified the strategies teachers and learners use to address the challenges they encounter in teaching and learning upper primary mathematics. The chapter comprises of the research design, population of study, sample and sampling procedure, research instruments, validity, reliability, data collection procedure, data processing; analysis procedure and ethical considerations.

#### 3.1 Research Design

This case study adopted a mixed-methods design, which integrated both quantitative and qualitative data collection methods. The approach capitalized on the strengths of each approach and offsets the different weaknesses that prevail within each paradigm. It provided more comprehensive answers to research questions by going beyond the limitations of a single approach. The quantitative approach was used to enable the study's findings to be generalized in the region. The quantitative approach allowed the researcher to access information that lead to challenges of teaching of upper primary mathematics (Creswell, 2014). Quantitative approach involves a significant representative sample of the population as a procedure for gathering data. It involves the collection and analysis of numerical data through surveys, questionnaires, and checklists. Data assisted in highlighting challenges that were encountered by teachers in the

teaching of mathematics which affect mathematics performance in upper primary. Through quantitative approach, personal bias can be avoided by the researcher keeping a 'distance' from the participating subjects and employing subjects known to them (Miles, Huberman & Saldama, 2013).

Qualitative approach was also found suitable for this study as it was used for testing objective theories by examining the relationship among variables (Creswell, 2014). The qualitative approach was also suitable for this study because it is an analysis of people's individual and collective social beliefs, thoughts and perceptions. Qualitative approach is primarily concerned with understanding the social phenomena from the participant's perspective. The qualitative approach is a systematic, interactive approach which is used to describe experiences and meanings of life (Wegner, Issak, Tesch & Zehne, 2016). In this approach, research is conducted in a natural setting and involves a process of building a complex and holistic picture of the phenomenon of interest (Wegner et al, 2016). The approach is characterized by collection of a rich and detailed data from participants. Since human emotions are difficult to quantify, qualitative research seems to be more effective than quantitative for analyzing emotional responses. In this approach, open ended questions are used to explore the experiences.

The qualitative approach helped the researcher to accord the participants to air their own opinions on the challenges encountered in teaching upper primary mathematics. Qualitative approach helped in developing concepts and theories that lead to understanding the social-world, which is an inductive approach to the development of theory. The qualitative approach also helped the researcher to collect information based on the words from a small group of individuals so that the participants' views were obtained.

### 3.2 Population of Study

The population for the case study was teachers and learners in upper primary schools in Mogoditshane village which has four primary schools and samples of both teachers and learners were picked randomly from each of these schools. Teachers are part of this study because they must interpret students written work, analyze reasoning and respond to different methods students might use when handling mathematics and activities. Teachers are also the ones responsible for the grading of mathematics as well as engagement in the formulation of mathematics syllabus. All learners in upper primary do mathematics as a core subject therefore they form part of this study. Upper primary learners were selected as part of the population as they are the ones who can testify the challenges they encounter whilst studying upper primary mathematics.

### 3.3 Sample and Sampling Procedure

The case study was undertaken in four primary schools in Mogoditshane, a village in the Kweneng region. Out of the four schools, three classes from each school were chosen. The three constituted the three levels of upper primary; standard 5, standard 6 and standard 7. In the four schools, in each standard, there are three to four classes per standard and the choice of classes was done using random sampling. One class per standard was randomly picked for the study. Four students from each standard were randomly chosen giving a total of twelve in each sampled school. The exercise gave a sample of forty eight students who participated in responding to the questionnaire.

Teachers in each school were chosen through simple random sampling just like students. Five upper primary teachers were randomly picked. The total number of teachers who took part in this study was twenty chosen to respond to the questionnaire.

The sample for interviews of both students and teachers was picked from those who responded to the questionnaires. The interview was administered on eight students who were randomly selected from each of the four schools. Here two students were selected from each school. Similarly, four teachers were chosen through random sampling, in which one teacher was picked from each school.

### 3.4 Research Instruments

Questionnaires and interview guides were used to collect data. The questionnaires ascertained the strategies that must be put in place in order to improve students' performance in upper primary mathematics. Interview guides were used to collect the qualitative data while questionnaires were used to collect the quantitative data. Data from the interview guides was used to answer questions on the opinions of teachers and learners that challenge them in teaching and learning upper primary mathematics. The purpose of combining the instruments was to enrich information through triangulation as well as to provide strengths that offset the weaknesses of both the qualitative and quantitative research findings or to explain the findings. Using the two instruments helped the researcher to provide an approach for developing better, more context specific instruments (Creswell, 2014). Combining quantitative and qualitative approach helps in widening the scope of the research as well as collecting data about a wider range of interest.

### 3.4.1 Questionnaires

The researcher designed two questionnaires, one for teachers and the other one for learners. The questionnaire for teachers contained 30 items composed of 10 items on the challenges faced by teachers when teaching upper primary mathematics, ten items on challenges faced by learners as they learn mathematics and 10 items on the strategies to be put in place to improve students' performance in mathematics. Questionnaires for teachers were used to collect data about the adequacy of materials used by teachers when teaching mathematics. The researcher also used questionnaires in order to establish if there is team work among teachers during mathematics teaching as well as to find out if there is parental involvement in-service education and the use of technology when teaching and learning of mathematics.

The questionnaires for learners contained 25 items composed of 10 items on challenges faced by learners as they learn mathematics, 10 items on whether there are enough resources to be used during the teaching and learning of mathematics and 5 items on strategies that learners think must be employed to help in the teaching and learning of mathematics so as to improve performance in mathematics. The questionnaire for teachers contained 20 Likert scale questions and 10 structured questions on the challenges encountered by teachers as well as the strategies to be used to solve the challenges encountered. A predefined series of questions were used to collect data from both teachers and learners. Closed and open-ended questions were used to collect data. In closed ended questions, both teachers and learners were given a list of predetermined responses from which to choose their answers. In open ended question, teachers and learners answered each question in their own words. The participants pointed out their degree of agreement with the statement using a five point Likert- type scale, from strongly agree to strongly disagree. Scores were awarded according to how respondents view the statements.

The score 5 was awarded to strongly agree, 4 to agree, 3 to neutral, 2 to disagree and 1 to strongly disagree. Frequency tables that use descriptive statistics particularly percentages were used to display and help show how many of the participants fall into different categories. Scores were used to measure respondents attitudes to a particular question and what was considered was the mode the frequent responses. A Likert scale composed of a series of five Likert type items that represent similar questions was combined into a single score.

The questionnaires contained the closed ended questionnaire items which were opted because the researcher intended to collect quantitative data on the challenges encountered by teachers and learners in the teaching and learning processes in the four primary schools in Mogoditshane. Closed items yield higher percentages than open ended questions for answers that are identical in both question forms. (Reja, Manfreda, Hlebec & Vehovar, 2003).

#### 3.4.2 Interview guides

The researcher designed two interview guides, one for teachers and the other for learners. The interview guide for teachers contained four questions composed of items on challenges, resources, curriculum and parental involvement. The researcher chose resources because learning materials are important as they significantly increase student achievement and support learning. The curriculum is also viewed important as it consist of activities needed to translate educational goals into concrete activities. The researcher also included parental involvement because parental involvement provides support to learners particularly when they face academic challenges. Parental involvement also results in good academic performance of the learner as there would not be a gap between the learner, parent and the teacher. Three questions were posed on each item. Interviews were used to find out the challenges teachers normally encounter when teaching mathematics, the resources that they normally use when teaching mathematics, what must be



done in order to develop the curriculum as well as to find out whether there is support from parents in the teaching of mathematics or not. Interview guide for learners contained three questions composed of items on challenges encountered by learners, home support and resources. Four sub questions were derived from each item. Interview questions aimed to find out whether learners get support at home as they learn mathematics, whether there are enough resources to be used during learning of mathematics and whether they like mathematics.

The interview questions were developed by the researcher grounding on the research questions and the reviewed literature. The rationale of the interview was to establish challenges encountered by both teachers and learners in teaching and learning of mathematics. The interview guide was found valuable in this study as it allowed the interviewer to explore and dig deep enough to acquire a true picture of views and opinions which helped to gain more information and greater clearness. The interview helped the researcher to get the data about the participant's experiences. Interviews were done to prevent or minimize bias in the design of the questionnaires and to obtain detailed information about personal feelings, perceptions and opinions as interviews allow more questions to be asked by the interviewer.

#### 3.4.3 Validity of instruments

The content validity of instruments was validated by the researcher's supervisor and two experienced mathematics lectures in the University of Botswana. Validation was done so as to make sure that the instrument accurately measures what it aims to do regardless of the respondents. Taylor, Sinha and Ghoshal (2006) state that, validation is a procedure that demonstrates an activity carried out in testing and then production maintains the desired level of compliance at all stages.

The validation of instruments also ascertained clarity of items and checked if the instructions are clear to the respondents as well as to carefully review the items and make any necessary recommendations to ensure that the instrument provide data that will assist in responding to research questions.

#### 3.4.4 Reliability of instruments

To establish reliability of all instruments, a pilot study was undertaken in a school that was not part of the study. The sample of the pilot study was smaller than that of the actual study. Four teachers and twenty students who were not part of the actual study participated. All teachers responded to questionnaires and some were sampled for interview following questionnaire administration. The same technique was used for learners. A questionnaire was administered to twenty learners and five were sampled for interview administration. This assisted in finding any uncertainties that might have been unnoticed by the researcher as well as to determine consistency in the instrument. Piloting was done to test the appropriateness of data collected and to identify potential problem areas and deficiencies in the research instruments and protocol prior to implementation during the full study research. Piloting also determined the instrument suitability and the level of understanding of the questionnaire as well as questions for the interview. Piloting helped to ensure that questions and instructions were clear and allowed the researcher to remove items that did not yield usable data (Bell, 1999). Piloting helped the researcher to become familiar with the procedures to be followed prior to full study research and to identify problem areas and deficiencies in the research instrument. The researcher was able to correct some of the errors that were identified during piloting and this helped the researcher when conducting a full research. Some of the corrections includes spelling errors in the questionnaire instrument and minor changes were made as a result of feedback from this

piloting. The following table shows a summary of how reliability was checked. The test showed that the test was reliable since any reliability coefficient of .70 or higher is considered acceptable in most social science research situations.

		N	%
Cases	Valid	5	100.0
	Excluded	0	.0
	Total	5	100.0

a. List wise deletion based on all variables in the procedure.

Cronbach's Alpha	N of Items
.713	25

### 3.5 Data Collection Procedure

Prior to collecting data from participants, permission was sought from the Ministry of Basic Education (See Appendix F) and the head teachers (See Appendix H) of the sampled schools to get authority to collect data. The researcher sought for permission from Mogoditshane/Thamaga sub region from the Principal Educational Officer 2 (See Appendix G) to collect data in the selected schools. With the granted permission, (See Appendix H) the researcher arranged with school teachers with the procedures for data collection from the respective schools. Consent was also acquired from those individuals who took part in the study. This was done by the participant signing an informed consent form (See Appendix K) to take part in the study. Data collection at each school started with sampling both students and teachers in upper primary. The questionnaires were hand delivered to the sampled schools and were given to the head teachers who were the contact persons for learner and teacher participants.

Respondents were given two weeks to complete the questionnaires. This was done to give respondents enough time to complete the questionnaire. The head teachers assisted in collection of the questionnaires from the participants.

After collecting questionnaires, time for the interview was agreed for respondents sampled in each school. An unoccupied classroom was used for interview. Interviews were done in the afternoon where there was less distraction by other learners. At all times, the nature and purpose of the interview was explained to participants for clarity to avoid any problem or questions that may rise during answering of the instrument. Learners were interviewed first and later teachers were interviewed, in both cases the interview was one-on-one.

The interviewees allowed for audio recordings of the information. A Huawei media Pad T1 8.0 tablet was used for recording. Recording was chosen because it would be easy to return to the transcripts later for other forms of analysis and it would be easy when picking out direct quotes when writing. The information collected was treated confidential. Even though recording is seen as very effective, Williams (2013) posits that, “recording was done to protect biasness and provides a permanent record of what was said and was not said. This also helps during data analysis procedure.” (p. 43). Each respondent was given 20 to 30 minutes depending on each person’s knowledge about the topic. The timing of the interview was determined by the schools’ time table and some other school activities.

### 3.6 Ethical Considerations

For ethical considerations, the letter for permission to conduct the study was written to the Ministry of Basic Education and to the head teachers of the participating schools explaining the purpose of the study. Participants who took part in the study were free to participate and at

liberty to withdraw at any time. In this study, the respondents were allowed to withdraw if they felt anxious to participate. The respondents were aware about the reason for conducting the study, and how the information will be used. The researcher issued consent form enlightening to the respondents the purpose and nature of the study and how they would assist by participating. Before the study was conducted, the respondents were knowledgeable about the nature of the instrument. Therefore, the researcher provided consent form before participants responded. The researcher made sure not to expose the respondent's identity.

### 3.7 Data Processing and Analysis Procedure

A quantitative approach to data analysis was used to interpret the responses and to identify the challenges encountered in teaching and learning of upper primary mathematics. The researcher processed consolidated data from questionnaires so that they were usable. This called for data cleaning and organising. Data cleaning involved the detection and removal of errors inconsistencies in a data set or database to the corruption, inaccurate and irrelevant data was identified and then replaced, modified or deleted. The data collected through questionnaires was analysed using tables that use descriptive statistics particularly percentages. The data collected through interviews was transcribed and categorized into themes systematically and interpretation was made accordingly. There were no discrepancies in the data collected. Through data cleaning, errors and inconsistencies from the data were detected and removed from the data in order to improve the quality of the data (Kashyap & Viradiya, 2014).

To analyse data, levels of Likert scale numerical values were given. Likert scale is an ordered scale from respondents to choose one option that best aligns with their view. Likert scale was used to measure respondents' attitude by asking the extent to which they agree with a

particular question or statement (Noble & Morton, 2013). Scores were awarded according to how respondents view the statements. The score 5 was awarded to strongly agree, 4 to agree, 3 to neutral, 2 to disagree and 1 to strongly disagree. Frequency tables that use descriptive statistics particularly percentages were used to display and help show how many of the participants fall into different categories.

This descriptive statistics method of analysing data was found suitable for this study because it uses simple analysis which forms the basis of virtually every quantitative analysis of data. The researcher used Statistical Package for Social Scientists (SPSS) to analyse data. Quantitative data was tabulated and analysed by the use of simple frequencies and percentages. The findings were presented using frequency distribution tables and percentages. Descriptive analysis helps in describing what is or what the data shows and present quantitative descriptions in a manageable form. The researcher chose this method of analysing data because the method helps in simplifying large amount of data in a sensible way. Through descriptive analysis, the percentage summary on a single variable can be reported. Descriptive analysis generated data that lead to important recommendations on how to address challenges that teachers and learners encounter during teaching and learning processes in upper primary mathematics.

A qualitative approach to data analysis was used to interpret the responses and to identify emerging themes about the challenges encountered in teaching and learning of upper primary mathematics. The challenges encountered in teaching upper primary mathematics and the strategies that can be put in place to improve upper primary mathematics performance were answered using interviews. The information collected from interviews was transcribed. Once all the research interviews were transcribed and checked, the researcher described the data and classified it into themes and interpretation was made accordingly. The interpretation of data

assigned a meaning to the information analysed and determined its signification and implications. The researcher gave a descriptive account of the data; that is, what was actually said or written with nothing read into it and nothing assumed about it. The data collected from the transcribed information contained data about challenges that teacher encounter as they teach upper primary mathematics. The data also helped the researcher to strengthen and deepen the data generated from questionnaires and the researcher looked at what is meant by the response, what was inferred or implied as respondents' voices were recorded.

## CHAPTER FOUR

### DATA PRESENTATION, ANALYSIS AND DISCUSSION OF FINDINGS

#### 4.0 Introduction

This chapter presents, analyses, and discusses the findings of the study that aimed at establishing challenges of teaching upper primary mathematics in Mogoditshane. The chapter is made of three sections. The first presents data and analysis on teachers' challenges in teaching upper primary school mathematics. The second section offers data and analysis on learners' challenges in upper primary school mathematics. The third section presents discussion of the finding.

#### 4.1 Teachers' Challenges in Teaching Primary School Mathematics

Challenges faced by teachers were identified through analyzing quantitative data that was collected using responses from questionnaires and qualitative data that was collected from open ended interview questions. The questionnaires and interviews sought to establish challenges of teaching upper primary mathematics. The challenges were categorized in terms of; resources, syllabus, teacher-learners ratio, parental involvement, teaching of mathematics, in-service education of mathematics teachers and the use of technology. These challenges did not emerge from the study data, but were pre-determined from the literature. Questionnaires were formulated with the challenges in mind, establishing how the pre-determined challenges fare in the four schools in Mogoditshane.

##### 4.1.1 Resources

Analysis of the questionnaires data revealed that limited resources in mathematics teaching particularly mathematics textbooks has a negative impact in the teaching of mathematics. This is



evident from the eighty percent (80%) of the respondents who agreed that there is shortage of mathematics textbooks as a challenge in their respective schools. Fifteen percent (15%) disagreed that there is shortage of mathematics textbooks while five percent (5%) was neutral. Fifty five percent (55%) of the respondents agreed that inadequate classroom space negatively affect the teaching of mathematics. Forty percent (40%) of the respondents disagreed while five percent (5%) were neutral. Sufficient resources in schools were shown by only fifteen percent (15%) of the respondents who agreed that schools provide sufficient resources to assist in the teaching of mathematics. Fifty percent (50%) of the respondents disagreed while thirty five percent (35%) were neutral.

Table 1

*Mathematics Teaching Challenges Associated with Resources (N=20)*

Questionnaire items	SA N (%)	A N (%)	N N (%)	D N (%)	SD N (%)
Availability of mathematics textbooks is a challenge in our school	5(25)	11(55)	1(5)	3(15)	0
Inadequate classroom space negatively affects the teaching of mathematics	7(35)	4(20)	1(5)	8(40)	0
The school provides sufficient resources to assist me in the teaching of mathematics	1(5)	2(10)	7(35)	10(50)	0

SA-strongly agree A-agree N-neutral D-disagree SD-strongly disagree

Respondents were also asked to respond to posed questions on the impact of availability of textbooks on the achievement of mathematics by learners. Teachers mentioned that there are insufficient resources such as mathematics textbooks which makes teaching ineffective and lead to poor performance of upper primary mathematics. Teachers also mentioned that there is shortage of teaching mathematics resources such as textbooks and inadequate classroom space which makes mathematics teaching difficult and cause poor performance in mathematics.

The inadequacy of resources was further confirmed by teachers' interview results. One of the teachers when asked; "Do you think those resources are enough to be used in the teaching of

mathematics?” responded, *“lack of textbooks hamper the teaching and learning processes as the learners share mathematics textbooks which then prolong time stipulated for the lesson.”*

Insufficient textbooks make learners to share books which then become difficult to work fast on the stipulated time for mathematics lesson. One of the teachers emphasized that; *“Mathematics textbooks provided by the government are not enough for teaching mathematics”* Teachers also mentioned that there is a shortage of mathematics teaching aids such as classroom posters, projectors, calculators, mathematical instruments and rulers to be used by learners. The other resource that seem limiting to teachers is the photocopying machine. Teachers in one of the schools mentioned that they have one photocopying machine which is not enough for making revision papers for the whole school. They said that if learners do not get thorough revision, they would not do well in their studies due to lack of practice. The interviewed teachers also emphasized that there is shortage of classrooms for teaching and learning. As a result, learners are taught under harsh weather conditions which are not conducive for learning. Poor conditions of classrooms limit active participation in learning.

#### 4.1.2 Syllabus

Analysis of data obtained from questionnaires confirmed that eighty percent (80%) of teachers agreed that the syllabus is packed with many topics to be taught within a short period of time. Fifteen percent (15%) of the participants disagreed while five percent (5%) were neutral. Twenty five percent (25%) of the respondents agreed that time allocated to mathematics lesson is enough to cover the syllabus content. Seventy percent (70%) of the respondents disagreed while five percent (5%) of the respondents were neutral.

Table 2

*Teaching Challenges Associated with Upper Primary Mathematics Syllabus (N=20)*

Questionnaire items	SA N%	A N%	N N%	D N%	SD N%
The syllabus is packed with a lot of topics to be covered in a short period of time	7(35)	9(45)	1(5)	3(15)	0
The time allocated for mathematics lesson is not enough to cover the syllabus content	2(10)	3(15)	1(5)	5(25)	9(45)

SA-strongly agree A-agree N-neutral D-disagree SD-strongly disagree

The interviewed teachers revealed that many topics in the syllabus hamper them from teaching effectively as they rush through topics in order to meet the stipulated time given to cover the topics in a term. One of the interviewees suggested that the syllabus needs to be established through insight of professionals and extensive research before the development of educational strategies.

One of the interviewed teachers mentioned that the timetable they use is packed with many subjects which limit time for mathematics, a subject that require more time. The teacher mentioned that one hour a day for mathematics lesson is not enough as there are some slow learners who need more time to explain some concepts to them.

Interviewed teachers who disagreed that the syllabus is packed with a lot of objectives to be covered in a short period of time mentioned that the time is suitable for mathematics. They mentioned that they have the knowledge of teaching mathematics to learners and they cover all topics and have time for revision. Teachers also mentioned in posed items that they are not able to complete the expected term topics given due to limited time offered for mathematics lessons.

Teachers responded that lack of syllabus coverage lead to poor performance in mathematics. Some respondents disagreed that time given to mathematics is not enough. Some interviewed teachers mentioned that the time given is fine as teachers should teach learners using

concrete materials to enhance the teaching of mathematics and to make it simple to learners to understand as some topics are introduced for the first time at each standard without specific connections being made to previously covered topics and using concrete materials to teach will save time.

#### 4.1.3 Teacher-learners ratio

The results revealed that there is high teacher-learner ratio. Ninety five percent (95%) of the respondents strongly agree that high teacher-learner ratio negatively impact on the teaching of upper primary mathematics. Five percent (5%) of the respondents disagree that teacher-learners ratio affect the teaching and learning of mathematics.

Table 3

*Mathematics Teaching Challenges Associated with the Ratio of Learners to Teachers (N=20)*

Questionnaire item	SA N (%)	A N (%)	N N (%)	D N (%)	SD N (%)
High teacher-learner ratio negatively impacts the teaching of upper primary mathematics.	14 (70)	5 (25)	0	1 (5)	0

SA-Strongly agree A-agree N-neutral D-disagree SD-strongly disagree

Respondents stated that they teach many learners in a class which makes teaching very ineffective. Teachers mentioned that the overcrowded classrooms lead to poor performance in mathematics.

Interviewed participants noted that high teacher-learner ratio makes teaching and learning challenging as some of the learners are not fully attended to during teaching. Teachers said that they teach more than thirty five learners. Teachers complained that they have many students in class who need support, but it becomes a challenge as teachers cannot manage all of them.

Teachers mentioned that if they were to teach between twenty and twenty-five learners then they could yield better results. One of the respondents mentioned in an interview that teaching a large number of learners in a class limits the ability to offer learners individual assistance accordingly.

With a small number of learners per class, teachers believe that it is advantageous for them to know their learners better and address their individual needs accordingly. Some of the interviewees revealed that overcrowded classrooms lead to indiscipline of learners as they take cover behind others. The teacher alone is not able to teach effectively because of the crowded learners in a classroom. One of the interviewed teachers when responding to the question, “What challenges do you encounter when teaching upper primary mathematics?” stated that: “*We are experiencing disciplinary problems in the classroom due to the number of learners in the classes. We are unable to curb the unnecessary behavior in the classroom because the learners are many and we are failing to reach all of them.*”

#### 4.1.4 Parental involvement

The results demonstrated that parental involvement is a challenge in the teaching of mathematics. There is a low percentage of parental involvement in learning. Twenty five percent (25%) of teachers agreed that parents are involved in helping learners with mathematics homework. Seventy percent (70%) of the respondents disagreed while five percent (5%) were neutral. The results on supports are similar to those mentioned on involvement. Twenty five percent (25%) of the respondents agreed that parents support learning with mathematics homework. Seventy percent (70%) of the respondents disagreed while five percent (5%) were neutral.

Table 4

*Mathematics Teaching Challenges Associated with Parental Involvement (N=20)*

Questionnaire items	SA N (%)	A N (%)	N N (%)	D N (%)	SD N (%)
Parents are involved in helping learners with mathematics homework	2(10)	3(15)	1(5)	4(20)	10(50)
Parents support learners with mathematics homework	2(10)	3(15)	1(5)	5(25)	9(45)

SA-strongly agree A-agree N-neutral D-disagree SD-strongly disagree

Interviewed participants mentioned that lack of parental involvement brings frustration and demotivation and as a result mathematics teachers experience challenges when teaching mathematics. One of the respondents indicated that, *“Parents are not involved in their children’s school work. You give learners work and they do not do it.”* Lack of parental involvement consequently makes learners not to learn better and not to have confidence on their studies. Parents who are not involved in their children’s work will not have a better understanding of how their children perform at school.

#### 4.1.5 Teaching of mathematics

Analysis of the questionnaire data shows that fifty percent (50%) of the respondents agreed that teachers are not confident to teach mathematics. Thirty five percent (35%) disagreed while fifteen percent (15%) were neutral. Forty percent (40%) of the respondents agreed that teachers do not dedicate time outside class to assist learners with mathematics. Thirty five percent (35%) disagreed while twenty five percent (25%) were neutral.

Table 5

*Challenges Associated with Teaching of Mathematics (N=20)*

Questionnaire items	SA N (%)	A N (%)	N N (%)	D N (%)	SD N (%)
Most teachers are not confident to teach mathematics	6(30)	4(20)	3(15)	7(35)	0
Teachers do not dedicate time outside class to assist learners with mathematics.	5(25)	3(15)	5(25)	7(35)	0
Most teachers are adequately prepared to teach mathematics	2(10)	4(20)	4(20)	6(30)	4(20)
Teachers give learners feedback on class exercises in time	5(25)	11(55)	0	4(20)	0
Teachers experience challenges in teaching mathematics	5(25)	10(50)	1(5)	2(10)	2(10)
Poor performance in mathematics is due to lack of team teaching in mathematics	8(40)	4(20)	2(10)	2(10)	4(20)

SA-strongly agree A-agree N-neutral D-disagree SD-strongly disagree

Thirty percent (30%) of the respondents agreed that most teachers are adequately prepared to teach mathematics. Fifty percent (50%) disagreed while twenty percent (20%) were neutral. Eighty percent (80%) of the respondents agreed that teachers give learners feedback on class exercises in time while twenty percent (20%) disagreed. Seventy five percent (75%) of the respondents experience challenges when teaching mathematics. Twenty percent (20%) disagreed while five percent (5%) were neutral. Sixty percent (60%) of the respondents agreed that poor performance in mathematics is due to lack of team teaching in mathematics. Thirty percent (30%) disagreed while ten percent (10%) were neutral.

Participating teachers were also interviewed on the challenges they encounter as they teach upper primary mathematics. Interviewed teachers mentioned that they are expected to teach mathematics even though they do not have the knowledge and skills on how to teach the subject nor specialized in mathematics during their training. The teachers were also asked to say their views on how the challenges they encounter can be solved. One of the interviewed teachers

mentioned that, *“I prefer to teach only social studies, teaching mathematics for me is uninteresting and cumbersome”*. Another teacher mentioned that she is interested in teaching only Agriculture and she wishes teachers could be assigned to teach according to their interest and talent, or specialty. The interviewed teacher further mentioned that; *“there are many challenges that they encounter as they learn mathematics such as insufficient textbooks, a packed syllabus with objectives which makes them not to teach effectively.”* The interviewed teachers also mentioned that they request more textbooks to be provided in schools. Teachers also suggested that they wish to be assigned to teach subjects they specialized in during their training.

#### 4.1.6 In-service education of mathematics teachers

Teachers’ responses on the item on in-service education of teachers in the teaching of mathematics are presented in Table 4.1.6. The data revealed that a majority of respondents have not been offered in-service teacher education mathematics teaching. This is evidenced by sixty five percent (65%) of the respondents disagreeing that they are usually given in-service education on how to teach mathematics. Thirty percent (30%) of the respondents agreed and five percent (5%) of the respondents are neutral.

Table 6

*Challenges Associated with In-service Education of Teachers (N=20)*

Questionnaire Item	SA N (%)	A N (%)	N N (%)	D N (%)	SD N (%)
Teachers are usually given in service education on how to teach mathematics through workshops and seminars in their schools.	4(20)	2(10)	1(5)	6(30)	7(35)

SA-strongly agree A-agree N-neutral D-disagree SD-strongly disagree

Teachers stated that the Ministry of Basic Education select only few teachers for in service training and they feel a large number should be selected for in service training. Teachers stated



that with the knowledge and skills gained during in-service training, poor mathematics results could be reduced.

The interview also sought to establish from teachers whether there are in-service education programs provided as a way of improving the teaching of mathematics in their school. One of the respondents mentioned that, *“only few teachers in a region are taken for further training due to the fact that the government is not able to take a large number and as a result chances of being given the skills on how to teach mathematics are very low.”* Teachers mentioned that they wish the government would offer them a chance to participate in in-service training. The participants noted that the training would equip them with skills, knowledge and concepts of teaching school mathematics.

#### 4.1.7 Use of technology

Participating teachers were given statements to express their level of agreeing or disagreeing on the challenges they encounter when teaching upper primary mathematics in connection with technology.

Table 7

*Challenges Associated with Technology (N=20)*

Questionnaire items	SA N(%)	A N(%)	N N(%)	D N(%)	SD N (%)
Inadequate skills in technology negatively affects the teaching of mathematics.	7(35)	7(35)	1(5)	4(20)	1(5)
Lack of calculator skills negatively affects the teaching of mathematics.	3(15)	2(10)	2(10)	8(40)	5(25)

SA-strongly agree A-agree N-neutral D-disagree SD-strongly disagree

Analysis of the questionnaire data revealed that inadequacy of technological skills in the teaching of mathematics has a negative effect in teaching of mathematics. This is evident from the seventy percent (70%) of the respondents who agreed that there is an inadequacy of skills in technology by teachers which negatively affect the teaching of mathematics (Table 7). Twenty

five percent (25%) of the respondents disagreed while five percent (5%) were neutral. Twenty five percent (25%) of participating teachers agreed that lack of calculator skills has a negative impact in the teaching of mathematics. Sixty five (65%) of the respondents disagreed while ten percent (10%) were neutral.

The interview for teachers also revealed the challenges associated with technology. The teachers mentioned that they requested more technological resources to be provided in schools. One of the respondents mentioned that, *“I wish we could be supplied with more computers for easy teaching of mathematics.”* Teachers also said that they are unable to do work effectively due to insufficiency of computers and calculators in school. The teachers mentioned that internet installation should also be availed in schools for easy teaching of mathematics.

Teachers were also asked to respond to posed questions in the questionnaire. Teachers mentioned that there are no remedial programs done in school to improve the teaching of mathematics. Teachers also mentioned that there is insufficient time to do remedial work. Respondents were also asked to mention the major challenges they encounter when teaching mathematics and how challenges can be resolved. Teachers mentioned that there is insufficiency of resources such as mathematics textbooks and they wish the government to supply schools with enough resources. Teachers were also asked to write the impact of specialization on the teaching of mathematics. Teachers stated that lack of subject specialization makes teaching of mathematics difficult as some teachers have not specialized in mathematics during their training.

Some of the interviewed teachers disagreed that lack of specialization in mathematics makes learners not to perform well in mathematics. The respondents mentioned that those teachers who did not specialize in mathematics should seek help from those who specialized in mathematics so that they would give learners the correct information. Teachers should also be in

a position to go extra mile by learning other means of teaching so that they would be effective when teaching.

#### 4.2 Learners Challenges in Upper Primary School Mathematics

Learners' challenges in upper primary mathematics were similarly obtained through a questionnaire and interview. The data obtained showed challenges that were categorized according to the themes; learners' challenges, resources, home support, technology and learning of mathematics.

##### 4.2.1 Learners challenges

Challenges encountered by learners when learning mathematics were assessed on teacher assistance in lessons, timely feedback and difficulty of mathematics questions. Results are provided in table 8.

The questionnaire data revealed that thirteen (41.6%) learners agreed that they are assisted by their teachers during mathematics lesson. Twenty one (43.8%) learners disagreed while seven (14.6%) learners were neutral. Learners also indicated their position on the statement on whether they are normally given feedback on time after mathematics lessons. Seventeen (35.5%) learners agreed, twenty seven (56.2%) learners disagreed and four (8.3%) learners were neutral.

Participating learners also indicated their position on the statement about the difficulty of mathematics questions. Twenty (41.7%) learners agreed that questions that are given to them are difficult while twenty three (47.9%) learners disagreed. Five (10.4%) learners were neutral.

Table 8

*Challenges Associated with Learning of Mathematics (N=48)*

Questionnaire items	SA N (%)	A N (%)	N N (%)	D N (%)	SD N (%)
My teacher assist me during mathematics lessons	7(14.6)	13(27)	7(14.6)	9(18.8)	12(25)
I am normally given feedback on time after mathematics lesson	9(18.8)	8(16.7)	4(8.3)	16(33.3)	11(22.9)
Majority of questions in mathematics are difficult for me	8(16.7)	12(25)	5(10.4)	9(18.6)	14(29.2)

SA-strongly agree A-agree N-neutral D-disagree SD-strongly disagree

Learners who participated in the interview mentioned challenges they encounter as they learn mathematics. The challenges mentioned included: Insufficient mathematics textbooks; Teachers take a long time to mark their work due to high ratio of learners to teachers. One learner when asked to mention the problems they encounter when learning mathematics indicated that, *“we are sometimes given feedback the following day. This makes us not to follow well with what we were doing in class.”* Learners also mentioned that they have shortage of resources which hinder learning of mathematics. Some learners also mentioned that they have poor pre-requisite concepts and therefore they are not able to do well in mathematics. This therefore brings in poor performance in mathematics.

The respondents expressed suggestions meant to help them learn mathematics. One suggestion was that more mathematics teachers should be hired to solve the problems of overcrowding in class. They also suggested that mathematical materials such as mathematical sets should be provided to schools.

#### 4.2.2 Resources

Participating learners in the study indicated their level of agreement on the statement given concerning the impact of resources in learning of mathematics. The statements covered items on time, textbooks and teaching aids in which they were to indicate their level of agreement.

Table 9

*Impact of Resources in Learning Mathematics (N=48)*

Questionnaire items	SA	A	N	D	SD
	N (%)	N (%)	N (%)	N (%)	N (%)
The time given for mathematics lessons is enough for finishing exercises give to me	6(12.5)	7(14.6)	4(8.3)	21(43.75)	10(20.8)
Insufficient textbooks in our class makes us fail mathematics	7(14.6)	6(12.5)	2(4.2)	11(22.9)	22(45.8)
There are enough mathematics textbooks to be used during mathematics lesson	4(8.3)	10(20.8)	6(12.5)	10(20.8)	18(37.5)
We have regular study time for mathematics	17(35.4)	11(22.9)	5(10.4)	9(18.8)	6(12.5)
Teachers use teaching aids when teaching mathematics	3(6.3)	6(12.5)	4(8.3)	6(12.5)	29(60.4)
There is a variety of mathematics resources I use beyond the textbook at school	7(14.6)	6(12.5)	19(39.9)	16(33.3)	-

SA-strongly agree A-agree N-neutral D-disagree SD strongly disagree

Learners indicated the extent at which they agree or disagree with the statement on whether the time given for mathematics lessons is enough to finish exercises given. Thirteen (27.1%) of the respondents agreed that time given for mathematics is enough for completing exercises given to them. Thirty one (64.6%) disagreed while four (8.3%) were neutral. Learners also indicated the extent at which they agree to disagree with the statement that ‘insufficient textbooks’ in their class makes them fail mathematics. Thirteen (27.1%) of the learners agreed that there is insufficiency of mathematics textbooks which makes them to fail mathematics. Thirty three (68.8%) disagreed while two (4.2%) of learners were neutral. Learners indicated their level of agreement with the statement that there are enough mathematics textbooks used during

mathematics lessons. The results showed that fourteen (29.2%) of the respondents agreed, twenty eight (58.3%) disagreed while six (12.5%) of the respondents were neutral.

Learners indicated whether they have regular study time for mathematics. Twenty eight (58.3%) learners agreed. Fifteen (31.3%) disagreed while five (10.4%) learners were neutral. Learners were also asked to indicate their level of agreement on whether their teachers use teaching aids when teaching mathematics. The results show that nine (18.8%) of the respondents agreed. Thirty five (72.9%) of the participating learners disagreed while four (8.3%) learners were neutral.

Learners were requested to indicate their level of agreement with the statement whether there are varieties of mathematics resources that they use beyond the textbook at school. The results showed that thirteen (27.1%) of the respondents agreed that they have a variety of the resources. Sixteen (33.3%) of the respondents disagreed while nineteen (39.6%) were neutral.

Learners were also asked to state the challenges they encounter as they learn mathematics. Learners stated that they sometimes do not understand when the teacher teaches. They also mentioned that they are many in the class which causes a lot of disturbances during learning and the teachers are not able to assist them thoroughly. Learners also stated that there is insufficient mathematics learning resources such as textbooks, calculators and computers. Learners were also asked to state how the challenges can be resolved, they mentioned that time for mathematics lesson should be increased, learners should be given homework regularly and mathematics resources should be supplied to schools. Learners also stated that teachers should do a lot of remedial work to help those who have difficulties in mathematics.

Learners were also asked to list any mathematical equipment which they feel must be provided in schools in order to help in learning of mathematics. Learners listed calculators,

mathematics sets, computers, mathematics games and puzzles, mathematics textbooks and counters.

Learners were also asked to express their views on resources in an interview. The learners confirmed that resources required for effective learning of mathematics were inadequate. The issue of resources mentioned included: availability of classrooms, textbooks, and computers. Learners indicated that classrooms are not enough for classes in a school and shortage of classrooms result in sharing. One week a class uses a classroom and the subsequent week they are taught outside. Learners reported that classrooms are in a poor state with cracked walls and floors, and shattered windowpanes. The poor state of classrooms hinder teaching and learning processes as learners are not able to concentrate during harsh weather conditions.

One of the learners when interviewed about which materials for mathematics they wish to be available in their classes mentioned that, “*we need meter rulers, grid board, mathematical sets, calculators and computers*”. Learners also mentioned that there are few mathematics textbooks which make it difficult for them to learn mathematics effectively. Learners mentioned that insufficiency of textbooks makes them not to perform well in mathematics as they have nothing to use at home when given homework. Some learners mentioned that their parents are not able to help them in the absence of textbooks.

#### 4.2.3 Home support

Participating learners indicated their level of agreement on statement given on home support concerning learning mathematics. The results are shown on the table below.

Table 10

*Challenges Associated with Home Support (N=48)*

Questionnaire items	SA N (%)	A N (%)	N N (%)	D N (%)	SD N (%)
I normally get support at home when doing mathematics homework	24(50)	15(31.3)	5(10.4)	2(4.2)	2(4.2)
Our mathematics teacher gives us mathematics homework most of the time	13(27.1)	9(18.8)	6(12.5)	14(29.2)	6(12.5)
We are given mathematics homework regularly	16(33.3)	21(43.8)	2(4.2)	5(10.4)	4(8.3)

SA-strongly agree A-agree N-neutral D-disagree SD-strongly disagree

Thirty-nine (81%) of learners agreed that they are supported at home when doing mathematics. Four (8.4%) of the respondents disagreed and five (10.4%) of the respondents were neutral. Participating learners were also probed if their teachers give them homework most of the time. Twenty two (45.8%) learners agreed. Twenty learners (41.7%) disagreed while six learners (12.5%) were neutral. Learners were also asked if they are given mathematics homework regularly. The question was asked purposely to check the learners' consistency on how often they are given homework. Thirty seven (77.1%) learners agreed. Nine learners (18.8%) disagreed and two learners (4.2%) were neutral.

Some learners were also interviewed to say out their views on home support and to mention the kind of support they get at home when learning mathematics. Some learners mentioned that sometimes their parents assist them with their homework while some mentioned that their parents fail to assist due to other commitments. Those who are helped mentioned that their parents work with them what have been assigned and explain to them where they do not understand. One learner mentioned that *"my mother always checks my work to see if I have done the exercise correctly and then sign as proof that indeed I was helped at home, before submitting to my teacher."* This statement shows that some learners are helped by their parents at home



with their homework. Learners who mentioned that they are not helped at home explained that they stay with their grandparents who are very old and are unable to help them with school work. Learners mentioned that their parents who could be helping them stay in town and hardly come to assist them with school work.

#### 4.2.4 Technology

Participating learners suggested their level of agreeing or disagreeing with the statement given to technology and school mathematics. Results are presented below.

Table 11

*Challenges Associated with Technology (N=48)*

Questionnaire items	SA N (%)	A N (%)	N N (%)	D N (%)	SD N (%)
I often use computer when learning mathematics at school	24(50)	5(10.4)	15(31.3)	2(4.2)	2(4.2)
Students are allowed to use calculators when doing mathematics	5(10.4)	2(4.2)	2(4.2)	19(39.6)	20(41.7)

SA-strongly agree A-agree N-neutral D-disagree SD-strongly disagree

Results show that twenty nine learners (60.4%) agreed that they often use computers when learning mathematics at school. Four learners (8.4%) disagreed while fifteen learners (31.3%) were neutral (Table 11). Analysis of data on the use of calculators when learning mathematics exercises by learners revealed that seven learners (14.6%) agreed that they are allowed to use calculators when learning mathematics at school. Thirty nine (81.3%) learners disagreed and two (4.2%) were neutral.

Learners were also interviewed on how they wish to be helped with technology when they learn mathematics. They mentioned that the number of computers and calculators should be increased for easy of use when learning mathematics. Learners mentioned that computers and calculators will enable them to calculate sums that seem difficult and too big to be calculated

mentally. Learners also mentioned that availability of computers will also enable them to work sums very fast and save time when learning mathematics. Learners further mentioned that having computers in school will not only help in mathematics but also help them in other subjects such as science in terms of researching when given homework.

#### 4.2.5 Learning of mathematics

Learners indicated the level in which they agree or disagree with the statement relating to learning of mathematics. Table 12 presents results obtained through the questionnaire.

Table 12

*Challenges Associated with Learning of Mathematics (N=48)*

Questionnaire items	SA N (%)	A N (%)	N N (%)	D N (%)	SD N (%)
Our teacher sometimes gives mathematics activities to be done in group or pairs	19(36.9)	11(22.9)	1(2.1)	10(20.8)	7(14.6)
Most of my classmates enjoy mathematics lesson	5(10.4)	5(10.4)	5(10.4)	14(29.2)	19(39.6)
We play mathematics games in class	15(31.3)	11(22.9)	13(27)	3(6.25)	6(12.5)
I normally get more than 50% in mathematics during end of term exam	6(12.5)	13(27)	8(16.7)	10(20.8)	11(22.9)
Teachers give learners time to do mathematics during the lesson	5(10.4)	15(31.3)	6(12.5)	13(27)	9(18.6)

SA-strongly agree A-agree N-neutral D-disagree SD-strongly disagree

Thirty (62.5%) learners agreed that their teachers give them mathematics activities in groups or in pairs. Seventeen (35.4%) of the learners disagreed while one (2.1%) learner was neutral. Learners were also asked to indicate their level of agreement with the statement on enjoyment of mathematics by classmates. Results show that ten (20.8%) of the participating learners agreed that classmates enjoy mathematics. Thirty-three (68.8%) learners disagreed while five (10.4%) of the respondents were neutral. On the statement of playing mathematical games during mathematics learning in their learning classes, twenty six (54.2%) learners agreed. Nine (18.75%) of the respondents disagreed while thirteen (27.1%) learners were neutral.

Participating learners indicated their level of agreement with whether they normally get more than 50% in mathematics during end of term examination. Nineteen (39.6%) learners agreed, twenty one (43.8%) disagreed and eight (16.7%) were neutral. The learners indicated their level of agreement with the statement on whether their teachers give learners time to do mathematics during lessons. Twenty (41.7%) learners agreed, twenty two (45.8%) learners disagreed while six (12.5%) learners were neutral.

Learners were also asked to state in a questionnaire if there are any remedial lessons designed to help them improve mathematics and how often remedial lessons are given to them. Thirty one learners stated that they are offered remedial lessons twice a week while seventeen learners stated that they are not offered remedial lessons at all. Learners also indicated topics which they feel are difficult for them to understand. The topics were; probability, fractions, area, games and puzzle, problem solving, percentages, ratio, algebra, perimeter and volume. Learners also indicated list games that they normally play during mathematics lessons. Learners listed puzzles, morabaraba, mhele, chess, bingo, diketo, dice and darts.

Learners were also interviewed on challenges associated with learning of mathematics. Learners mentioned that the time given to mathematics lessons is not enough. They mentioned that mathematics lessons need at least more than two hours so that they will be able to finish their work. Learners also mentioned that they do not enjoy mathematics as their teachers seem to be rushing due to limited time allocated to mathematics lessons. To utilize time allocated for mathematics, learners felt that teachers should use different methods of approaching mathematics exercises so that learners choose those approaches easy for them so as to save time allocated to mathematics. Learners will be able to choose the easiest approach to do mathematics exercises.

Learners also mentioned that exercises that require drill and practice should be suited for homework so as to save time and move to the next topics. Learners mentioned that teachers sometime do mathematical games and group work so as to enhance mathematics teaching.

#### 4.3 Discussion of the Findings

This section discusses the findings which were presented with the aim of establishing the extent to which the research questions have been answered. The purpose of the study was to establish challenges of both teachers and learners in the teaching and learning of mathematics at upper primary school level in Mogoditshane (Kweneng) primary schools in Botswana. The first research question dealt with upper primary teachers' challenges in teaching mathematics. The second research question dealt with the challenges learners encounter as they learn mathematics. The discussion is based on four sections covering: challenges encountered by mathematics teachers in teaching upper primary school mathematics; challenges learners encounter as they learn mathematics; Impact of challenges on performance in upper primary mathematics; and Suggestions that can improve mathematics performance.

##### 4.3.1 Teachers' challenges in teaching upper primary school mathematics

The challenges that teachers encounter as they teach mathematics were observed from a combination of different reasons such as insufficient resources, high student-teacher ratio, lack of parental involvement, and insufficient mathematics in-service education of teachers as well as syllabus content.

There is a high insufficiency of textbooks and those available are not accessible to the majority of either teachers or learners. Monyaku and Mmereki (2011) mentioned that only about two-thirds (62%) of the Standard 6 learners in 2007 had sole use of mathematics textbooks and this has dropped from the year 2000 when it was eighty percent (80%). The findings of this study

put availability of textbooks at sixty-nine percent (69%). This, as a result, shows that there are insufficient mathematics textbooks in primary schools which hamper teaching and learning of mathematics. Insufficiency of mathematics textbooks makes learning of mathematics to be compromised and therefore students cannot do well and hence poor performance in upper primary mathematics.

Teachers felt that there is insufficient time given to mathematics lessons which is a challenge when teaching upper primary mathematics as they teach learners of different capabilities and therefore the one hour lesson is not enough for slow learners. More time is needed and less time hampers the teaching of mathematics. Mji and Makgato (2006) stated that non completion of the syllabus is a major determination of the students' performance in mathematics.

Harn, Thompson and Roberts (2008) also stated that a consistent finding in the amount of time students are actively and successfully engaged in essential academic skills contributes significantly to achievement. Teachers felt that extra time is needed for mathematics lessons so that learners will acquire the skills and have knowledge in mathematics. Smith (2000) stated that increased time facilitates greater exposure to knowledge and skills and thus foster higher levels of achievement. Benavot and Amadi (2004) noted that student achievement increases when students are exposed to longer time periods in mathematics. Teachers believe that if mathematics lessons are given plenty of time, they will be able to organize their teaching well and impart learners with knowledge and skills needed for mathematics.

The study found that there was lack of technological resources such as calculators pertaining to challenges in teaching of upper primary mathematics. Zembat (2008) found that technology gives participants a chance to make a conjecture with the help of dynamic features (GPS, spreadsheet) and to evaluate results. Teachers feel that learners could be given electronic

calculators to work out sums that they cannot do mentally. This will enable teachers to speed up their mathematics teaching as the use of calculators will save time. Technology resources can greatly aid the process of mathematical exploration, and the use of such aids can help engage students. Calculators are typically seen as aiding arithmetical operations. Calculators are of much greater pedagogic value. Innovations in the design and use of calculators must be encouraged so that their use makes school mathematics enjoyable and meaningful. Calculators allow more freedom in teaching of mathematics and it is therefore the cornerstone of a modern organization of teaching mathematics (Rackov, 2011). Clark (2011) adds more to the advantages of calculators by stating that it is important to integrate calculator use so that students can derive the full benefit of familiarity with the instrument while maintaining a high level of student proficiency with paper and pencil calculations.

Respondents felt that they also need computers as aids in the teaching and learning of mathematics. Isaacs (2015) states that Thuto Net, the policy on the promotion of e-learning, is a critical component of education which states that there should be provision of modern PCs and Internet access to schools and there should be an increase in the ratio of PCs to learners to 1:7.

The internet connection makes it possible to search for images and videos that may be used to supplement explanations provided in class. Clark and Lyons (2004) indicate that images retrieved from the internet may carry out a range of functions, which may be analyzed both from a communications point of view and from a psychological perspective. Through the use of computers, teachers will be in a position to use images for explaining processes, mechanisms and procedures. PCs are also effective in teaching schematization (maps, graphs, diagrams), while image animations are useful for illustrating particular manifestations of phenomena.

Teachers in this study suggested that they should be provided with computers. Rackov (2011) mentions that innovations in the design and use of computers should be encouraged so

that their use makes school mathematics enjoyable and meaningful. Computers allow more freedom in the teaching of students and it is therefore the cornerstone of a modern organization of teaching mathematics (Rackov, 2011). Koshy (2012) further states that, “a good use of computers extend pupils mathematical thinking and understanding. Computers also make tasks easier” (p. 133). Goos and Bennison (2008) note that technology make calculations quicker, helps students understand concepts, enables real-life applications and allows students to see the link between different representations.

The findings of the study also revealed high student-teacher ratio as one of the challenges faced by teachers when teaching upper primary mathematics. Data obtained from questionnaires and interview revealed that the majority of teachers teach more than 35 learners in a class and this high teaching ratio hampers teaching of mathematics as teachers are unable to help each and every learner effectively. It is therefore, teachers wish that the number of learners be reduced to a manageable number of 15 or 20 learners in a class. Although this finding is ideal, it may not be practical considering financial and higher target or output. Teachers also wished that more teacher aids be hired, who will assist in classroom actives. In this case, teachers will have more time to teach as there will be fewer discipline problems to be attended to. Through a small number of learners, teachers will be flexible to use different instructional approaches as there will be no students hiding behind each other. Bayo (2005) ascertain that smaller classes benefit all pupils because of individual attention from the teacher. The implication of large class size has been attributed to teachers’ failure to give attention to weaker learners during teaching which results in low academic performance for such learners.

Participating teachers in this study also indicated that lack of content proficiency in mathematics teaching leads to poor performance in upper primary mathematics. They mentioned that schools have not put professional development mechanism in place which would help new

teachers to improve their teaching methodologies and knowledge in mathematics. Hamilton (2014) states that a competent teacher is the one who promotes consciousness to the students and helps them become conscious.

Teacher competence is looked at in terms of three key factors being; educational qualification, training and experience in the teaching profession. Competence is also developed through education, work experience and on-the-job training based on an exposure to a variety of activities that test an individual's ability to cope with the unusual circumstances while education provides the teacher with solid understanding of the subject matter. Education and work related experience also enhance the teacher's understanding of mathematical content.

Ochieng, Kiplagat and Nyongesa (2016) point out that teacher competence is looked at in terms of three key factors; educational qualification, training and experience in the teaching profession. Competence is developed through teacher education, work experience and on-the-job training based on an exposure to a variety of activities that test an individual's ability to cope with different situations. Teaching experience gained also improves the teachers' ability to cope with unusual circumstances while education provides the teacher with solid understanding of the subject matter. Education and work-related experience also enhance the teacher's understanding of the principles and concepts underlying efficient and effective delivery of mathematical content. The success of any pedagogical process also relies on other factors such as the mode of delivery of content, teacher preparedness, learner engagement in the learning process, which influence the desired student performance in mathematics.

Bruns (2017) argues that promoting the competencies of teachers is a key to improve not only the primary, secondary and higher secondary education but also the technical vocation education. From this perspective it is worth noting that in-service teacher education training programmes are essential for teaching. Kazmi, Pervez and Mumtaz (2011) indicate that in-



service training make teachers to be equipped with logical and systematic approaches to apply in class.

#### 4.3.2 Challenges learners encounter as they learn mathematics.

The challenges encountered by learners were observed from a combination of different reasons such as insufficient resources, high students-teacher ratio and lack of parental involvement. Analysis of results shows that there is insufficiency of resources such as textbooks, time, classrooms, computers and calculators. NCTM (2000) states that technology fosters mathematics understanding and makes learners to reinforce concepts and appeal to a wider variety of learning styles as well as to develop interest in learning the subject.

Analysis of results shows that lack of technological resources, high students- teacher ratio and insufficiency of resources lead to poor performance in mathematics. Teacher-learner interaction is an important aspect of a good education and academic achievement. La Paro, Pianta and Stuhlman (2004) viewed social and academic interaction between teachers and learners as a crucial determinant of academic success. The interaction between teachers and learners is generally believed to be affected by characteristics of teachers and learners. However, there are some other aspects that affect this interaction like the number of learners per teacher in a class. Number of learners per teacher is generally associated with class size and it is mainly believed that smaller classes provide better teaching and learning.

The childhood educator and the involvement of families at an early age result in more capable students who actively seek to overcome challenges and succeed over the course of their lives (Lemme, 2007). When parents and teachers come together to create a supportive learning environment, both the students and their families are empowered in many areas of life. Immediate benefits include better academic results, improved attendance rates, and diligent

completion of homework and other assigned work to learners by their teachers. As a parent, it is important to fully understand your child's development and learning processes. This enables parents to identify the strengths and weaknesses of the child and more importantly it helps the parent to understand the key areas in which the child needs support to succeed. By parents being more involved in children's work, stronger ties will be created between parents and school and the child's confidence will be built. Hornby (2011) mentioned that parental involvement helps in the improvement of children's attitude, behaviour and attendance at school. Parental involvement also improves parents-teacher relationship and teacher morale.

#### 4.3.3 Impact of challenges on performance in upper primary mathematics

A wide range of challenges affecting teaching and learning of mathematics in upper primary mathematics were identified by the researcher. These challenges have a great impact in the teaching and learning of mathematics. Insufficient resources were one of the challenges revealed by the results that affect the teaching and learning of mathematics. There is insufficiency of mathematics textbooks in upper primary mathematics which makes learners to share mathematics textbooks and this sharing hampers teaching of mathematics as time is wasted. Another challenge revealed by the results was high student-teacher ratio. High student-teacher ratio affects the teaching and learning of mathematics because teachers are unable to supervise and control large numbers of learners. Group work, discussion and class control becomes very difficult to do during teaching and learning as learners are many. Lack of parental involvement was also mentioned by the participants in the study as one of the challenges that impact mathematics teaching and learning. Learners are not helped by their parents at home as learners bring back work given to them by their teachers unattended which result in poor mathematics performance. Yan and Lin (2005) point out that, students whose parents are

involved in their education are more likely to perform better in mathematics and achieve more than other students

Teachers indicated that there is lack of in-service training which affects teaching and learning of mathematics. Teachers need to have the skills and knowledge in the teaching of mathematics. Inadequate training of teachers in mathematics affects mathematics teaching. Taylor (2010) mentioned that, the rate of production will be low when employees do not know how to perform their jobs confidently hence poor performance. Lack of content knowledge has a negative impact on student's performance.

Teacher preparation programmes allow specialization but teachers end up being deployed to teach all subjects on offer including mathematics which they did not specialise in was also stated as one of the challenges affecting the teaching and learning of upper primary mathematics. Mathematics performance becomes poor as teachers teach what they are not proficient with nor trained for. The idea of subject specialization allows teachers to focus on one or two subjects. They are able to reach a wide range of pupils in their subject area. At school level subject specialization provides an opportunity for a teacher to specialize in doing that single task which ensures efficiency in production. In this regard subject specialization is credited with improving quality of and efficiency in education production (Kapfunde, 2000). Specialization entails breaking each job into smaller tasks that are manageable. (Samkange, 2015).

Participating teachers also mentioned that the syllabus is loaded with a lot of objectives. This as a result makes learners not to perform well as teachers are not able to complete the syllabus in the stipulated time. Teachers further stated that insufficiency of computers in schools makes teaching difficult as computers would be helping them to make the work fast and easier and learners will be aroused in learning mathematics. They believe that provision of computers to schools will enhance the teaching process. Smaldino, Russel, Heinich and Molenda (2005)

state that, when technology is implemented, students become more interested in learning and learning becomes fun and more attractive to learners. Barron, Iyers, Lilavois and Well (2006) mentioned that technology provides an excellent avenue for students' motivation and instruction.

#### 4.3.4 Suggestions that can improve mathematics performance

Participating teachers mentioned suggestions that can be used in order to improve mathematics performance in upper primary. Some of the suggestions mentioned include reduction of learners in class from 40 to at least 20 to 25 per teacher. Teachers believed that with less number of learners, they will be able to assist learners effectively as working with a small number is manageable resulting in effective teaching and learning. Zingier (2014) stated that smaller class sizes are important for teachers as they will be able to achieve better academic outcomes for all the students in class. He also stated that children from disadvantaged families will be able to be fully attended to as the teacher will be able to reach all the students in class.

Parental involvement was stated by the respondents as one of the factors that should be used by teachers so as to improve mathematics performance. Participating teachers have found it of paramount importance for them and parents to be fully involved in learners' academic performance as this would yield good results. Parental involvement in the activities of the school has a positive impact on students' academic achievement and the success of the school (Christie, 2005; Halsey, 2004). Homework was one of the strategies found worth noting in the study which can be used to improve performance in upper primary mathematics.

In-service training of teachers was found by the participants as one of the strategies to be used in solving challenges encountered by teachers in teaching upper primary mathematics. Teachers mentioned that they are not supported through in-service education. In service training of teachers will help in improving and enhancing the necessary skills needed to interpret the concept changes accurately and to implement the modified curriculum according to its

requirements, aims and objectives. In-service training of teachers gives teachers the opportunity to tackle new challenges of guiding students towards higher standards of learning and self-development. Omar (2014) share the same sentiments by stating that:

In-service training act as a catalyst for teachers' effectiveness as well as a way of updating teachers' skills and knowledge for improving teaching and learning which lead to better job performance. In-service training is important for teachers to face new challenges and changes in the education world. In- service training is also a fundamental aspect to improve teachers' professionalism. The effectiveness of in-service training is important so that teachers can apply the knowledge acquired in teaching and learning. (p. 1).

As in any other profession, it is very important that teachers should be kept up to date on the most current concepts, thinking and research in their field so as to equip them with the current information as educators. There is need to have in-service education programme with clearly defined objectives, growth and improvement of instruction and leadership skills. In-service education should be recognized as part of institutional or organizational activity designed by government for staff development and motivation (Osamwonyi, 2016).

In-service education for teachers deal with the challenges teachers encountered in the teaching of mathematics. One of the gaps between these challenges is the gap between the level of teaching and understanding the concepts (Patkin & Levenberg, 2012). Lack of content knowledge has a negative impact on students' teaching; hence, if teachers understand the topic in depth, they can select effective activities (Taylor, 2010). This shows that skills and knowledge are essential for teachers in teaching of mathematics.

The deficiencies in teachers' content knowledge have a negative impact on student success (Baumert et al., 2010). This implies that there is need for teachers to have knowledge and skills in teaching of upper primary mathematics. A teacher will not know the need of the children if he

or she does not know the level of understanding between the learners. A good teacher is the one who knows his or her students' needs (Ainscow & Sandill, 2010). Participating teachers mentioned that their teaching skills as generalists need to be improved through seminars, workshops, in-service training and short courses on how to teach mathematics as this may improve learners' performance in mathematics.

Participating teachers urged that even though there is subject specialisation during teacher training, non-specialists teachers are expected to teach subjects that they were not oriented in. Lack of training of teachers makes untrained teachers for mathematics not to perform well as they are not conversant with the content to be taught. The teaching of mathematics should be limited to teachers who specialized in mathematics during their teacher training. Through subject specialization, teachers believe that they would become more competent in the subjects they specialized in rather than teaching all the subjects including those that they were not oriented in during teacher training.

Martin (2008) states that specialists understand their area of specialty so much that they are in a position to help when there is any problem that can arise during the teaching and learning process. There is thus no compelling reason why subject specialization should not be encouraged in primary schools considering the broad nature of primary education syllabus.

Sharpe (2001) and Mukhopadhyay (2014) share the same sentiments by stating that it is not easy for teachers to have the same degree of expertise of all the subjects in the syllabus. Therefore it is of paramount importance for teachers to teach what they have been trained for. Participants in this study advocated for subject specialization in primary schools. Teachers felt that teaching the subjects they are most proficient in would improve the quality of education and PSLE (Primary School Leaving Examination) results as it has been observed that the teaching of minor subjects is creating adverse effects in primary education (Mokotedi, 2013).

Most of the respondents felt that they need professional support in the form of mentoring, modelled lessons and peer teaching. Participating teachers in this study felt that such services would assist them to adjust to the demands of teaching mathematics, address challenges that may arise in the classroom during teaching and provide a model to emulate in teaching. Such models would therefore, help and enable teachers to gather different ideas on how to engage their learners and develop content proficiency when teaching mathematics. Participating teachers also revealed that they needed guidance and moral support from teachers who specialized in mathematics so as to help them to combat negative attitudes towards mathematics by both learners and teachers. In some instances, having another teacher in the classroom can offer a helpful second point of view, something that is good for the professional development for both teachers. When teachers receive these types of support, they would remain passionate about their work and as a result there will be good performance in mathematics in primary schools. Weimer (2015) share the same sentiments on the importance of mentoring by mentioning that mentoring provides professional socialization and personal support to facilitate success in graduate school and beyond. Weimer further mentioned that mentoring also helps employees to do the right thing by exposing those who are mentored to senior employees that know how to do the work the right way. Modelled lessons will help employees to perform more effectively which will yield good results.

## CHAPTER FIVE

### SUMMARY, CONCLUSION AND RECOMMENDATIONS

#### 5.0 Introduction

This chapter presents summary, conclusion and recommendations of the study. In the summary section, purpose of study, research questions, methodology used and the major findings of the study are presented. Thereafter, conclusions and recommendations are presented.

#### 5.1 Summary of Study

The study aimed at investigating the challenges of both learners and teachers in the teaching and learning of upper primary mathematics in Mogoditshane primary schools in Kweneng region.

The study was based on the research questions:

1. What are upper primary school challenges in teaching mathematics?
2. What challenges do learners encounter as they learn mathematics?

This study was designed as a case study investigating the challenges encountered by teachers in teaching upper primary mathematics in Mogoditshane schools. The rationale for the choice of the design allowed the researcher to focus closely on the challenges encountered by teachers and learners in teaching and learning of upper primary mathematics. The case study also made it possible to establish which aspects of mathematics teaching are problematic. Yin (2009) argued that a case study is used in order to understand a real-life phenomenon in depth.

Four Mogoditshane schools have been used in this case study. Five teachers in each school were picked using simple random sampling in upper classes which gave a total of twenty teachers who participated in the study. Out of the twenty teachers who were subjected to the questionnaire, four teachers were randomly selected for interview, one from each participating



school. Learners in upper primary classes from each school were picked. The three constituted of the three levels of upper primary; standard 5, 6 and 7 learners. Four learners from each standard were picked making a total of twelve learners. Twelve learners from upper primary classes were also randomly picked from each school making a total of forty eight learners who were subjected to questionnaire. Two learners were randomly picked out of the twelve that were subjected to the questionnaire from each school for interview session resulting in a total of eight learners.

Mixed methods approach which entailed of questionnaires and interview guides for both teachers and learners were used to collect data. The questionnaire items were composed of statements in Likert scale in which respondents were to indicate their level of agreement for each statement. The questionnaires also had qualitative items in which participants were to respond to posed questions relating to challenges of teaching upper primary mathematics. The questionnaires were hand delivered to the sampled schools and were given to the head teachers who were the contact persons for learner and teacher participants. Respondents were given two weeks to complete the questionnaires. This was done to give respondents enough time to complete the questionnaire. The head teachers assisted in collection of the questionnaires from the participants.

The interviews were conducted through one on one for teachers and group interviews for learners. A Huawei media pad T1 8.0 tablet was used to capture the words of the participants in an interview. Recording was done to protect biasness and to provide a permanent record of what was said. The researcher also took notes during interviews. Analysis of quantitative data was done using tables that use descriptive statistics particularly percentages. A Likert scale was used to measure respondents' attitude by asking the extent to which they agree with a particular question or statement. Descriptive analysis was found suitable for analyzing data as it helped in simplifying and describing data in a manageable form.

Analysis of interview data involved transcribing and categorizing outcomes into themes systematically and making interpretation accordingly. The themes included challenges encountered by learners, home support and resources. Analyzing of the results was done to find out if the data obtained from interviews correlate with that of the questionnaire.

Findings of the study offered numerous challenges that teachers and learners encounter in the teaching and learning of upper primary mathematics. Challenges that were offered by teachers include insufficient resources, few mathematics specialized teachers, high teacher-learner ratio, poor parental involvement, poor teaching methods, overcrowded classrooms, inadequacy of in-service training of teachers and insufficiency of mathematics resources. Insufficiency of mathematics textbooks negatively affects mathematics teaching hence poor performance in upper primary mathematics. Teachers mentioned that the government should supply mathematics teaching resources to schools.

The study also offered high teacher-learner ratio as one of the challenges leading to allocation of insufficient resources for mathematics teaching. This high teacher-learner ratio hinders teachers from giving mathematics sufficient practice to learners thus affecting the efficient and effectiveness of teaching upper primary mathematics. It also emerged from this study that the generalized approach of teaching in which teachers teach several subjects regardless of subject(s) they specialized in during their training comprises the quality of efforts given to the teaching of mathematics. This situation contributes to poor performance in mathematics. Graduates of primary teacher preparation will have specialised in a subject and what is lacking is the deployment of teachers to teach subjects in the area of specialization as opposed to teaching all subjects.

Data collected suggested that overcrowded classrooms have been a challenge when teaching upper primary mathematics because teachers spend more time managing behaviour

instead of teaching mathematics. Overcrowded classrooms make it difficult for mathematics teachers to connect with each learner on a deeper level. Time allocated for mathematics lesson which is one hour a day was seen not to be enough for mathematics lesson by the respondents. Participating teachers also mentioned that mathematics teaching time should be increased to at least two hours per day. Increased time in mathematics teaching will enable teachers to have ample time to assist learners accordingly. Teachers advocated for in-service training of teachers in mathematics which will help improve teachers' skills and knowledge in teaching upper primary mathematics.

Teachers also suggested cluster workshops for mathematics teachers in which they will be helped on how to handle difficult topics in the syllabus as well as how to incorporate new topics in the syllabus. Data collected revealed that parental involvement is of paramount importance as it can give the parents the opportunity to have an idea of what is happening at school as well as to understand their children's strengths and weaknesses in the learning of mathematics.

Learners also stated challenges they encounter as they learn upper primary mathematics. The challenges include; lack of mathematics resources, lack of time, overcrowded learners in a classroom and shortage of mathematics textbooks which makes studying of mathematics difficult. Learners revealed that one mathematics textbook is shared among four to five learners which impede them to work adequately during mathematics teaching and learning.

The challenges stated by both teachers and learners called for strategies to be put in place so as to solve the challenges encountered by teachers and learners in the teaching and learning of upper primary mathematics. Both teachers and learners advocated for more time allocation in mathematics teaching and learning, sufficient supply of mathematics teaching resources such as mathematics textbooks, computers and calculators, a suitable number of learners in the classroom, more parental involvement, in-service training of teachers to revive teachers with

teaching strategies and methodologies and subject specialization of teachers. The challenges that have emerged in this case study in Mogoditshane primary schools as major though not new are; teacher competencies, large class size, teacher specialization, teaching time and home support for learners. There are no certain challenges that are peculiar to Mogoditshane as majority of schools are not performing well in mathematics.

Lack of teacher competences also contributes a lot to failure of learners in Mogoditshane. Teachers have not been trained for mathematics during their teacher training but they are expected to teach mathematics. This brings in failure as learners are not being taught by teachers who are not competent enough to teach the subject. Large class sizes in Mogoditshane primary schools seem to be one of the causes of poor performance in mathematics. Teachers teach more than forty learners and they are not able to fully teach them nor to control the class. Time allocated to mathematics lesson is not enough. Teachers mentioned that a lot of time is needed for mathematics though there are other subjects which also needs time.

## 5.2 Conclusion

This study brought useful insights on challenges of teaching and learning of mathematics at primary school level, particularly on challenges that undermine both teaching and learning.

Based on the findings of this study, one can conclude that the future of mathematics learning is threatened, thereby calling for intervention from the relevant education authorities.

Mogoditshane primary schools should be an eye opener to other primary schools in Botswana so as to reduce poor performance in mathematics which is caused by some challenges such as lack of subject specialization and home support for learners. Teachers should teach what they have

been trained for during their teacher training programmes. Class sizes should be reduced to a reasonable number that can be managed by teachers.

This study adopted a mixed methods approach and was conducted at a small local scale which means that one cannot statistically generalize to the whole district, let alone the country. However, it is highly likely that similar challenges are experienced by teachers in all Botswana primary schools because the conditions are likely to be generally similar. Teachers are generally trained at the same level using the same approach. Resource management and availability is generally similar all over the country although there could be differences between rural and urban schools. This case study therefore, brought useful in-sight that can be used to design a more comprehensive nationwide study that could adequately inform the policy makers. Though it may take some time to amend national policies, change can be done at school level in order to make a significant change in the teaching and learning of mathematics.

Strategies such as peer teaching of difficult mathematics topics and concepts as well as subject sharing can help ease teachers' work load. Another important challenge that emerged from this study worth noting is the inadequacy of the in-service training of teachers. The fact that most of the teachers did not specialize in mathematics suggest that learners are taught by teachers with limited competencies and comprehension of important mathematics concepts, hence the nationwide decline in performance in mathematics. These results are therefore worth noting by the authorities at the Ministry of Basic Education who should perhaps consider subject specialization at primary level when deploying teachers, particularly in mathematics and science. The challenges for both learners and teachers seem to be lowering mathematics performance in Mogoditshane primary schools.

### 5.3 Recommendations

The study recommends the following:

1. A piloting program in a sampled school for five years in which teachers will be teaching subjects they have specialized in during their teacher preparation and ultimately compare students' performance with a school in which teachers teach all the subjects regardless of what they have specialised in during their teacher training.
2. Strengthening teacher-parent relationship to improve learners' performance not only in mathematics but in all areas of learning. More emphasis must be placed on the important roles that parents, families and communities must play in raising learners' performance.
3. Increase in supply of mathematics resources which include; time, classrooms, computers, calculators and textbooks in order to improve learning and ultimately better results.
4. In-service mathematics teacher education must be strengthened to assist teachers on handling mathematical concepts they deemed difficult to teach as well as to attain new skills needed to improve mathematics performance.

### 5.4 Recommendations for Further Research

Findings from this study are indeed preliminary and need to be supported by further research. The researcher recommends further research in which teachers' challenges will be examined from all regions in the country as the present study used participants from four Mogoditshane primary schools.

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## APPENDICES

### Appendix A: Questionnaire for Teachers

#### QUESTIONNAIRE FOR TEACHERS

My name is Neo Natalie Mosekiemang, MEd Student of Mathematics Education at the University of Botswana. The purpose of this questionnaire is to solicit your views regarding the challenges of teaching mathematics in upper primary. All your responses will be treated with confidentiality. The questionnaire has three sections. Please give your honest views by placing a tick in the appropriate corresponding space in sections A and B. Provide written responses in the blank spaces in section C.

Research Topic: Challenges of teaching upper primary mathematics. (A case study of Mogoditshane primary schools).

#### Instructions

Please assess the following statements and tick [✓] the most appropriate box that reflects your views regarding the teaching of mathematics in upper primary.

SA = strongly Agree; A = Agree; U = Uncertain; D = Disagree; SD = Strongly Disagree

	STATEMENTS	SA	A	N	D	SD
1	Availability of mathematics textbooks is a challenge in our school					
2	Most teachers are not confident to teach mathematics					
3	Teachers do not dedicate time outside class to assist learners with mathematics.					
4	High Student –teacher ratio negatively impacts the teaching upper primary mathematics.					
5	Most teachers are adequately prepared to teach mathematics					
6	Poor students-teacher relationship affects the teaching of mathematics.					
7	Irregular homework leads to poor performance in mathematics					
8	Inadequate skills in technology negatively affects the teaching of mathematics					
9	Lack of calculator skills negatively affects the teaching of mathematics					
10	Poor performance in mathematics is due to lack of team teaching to handle difficult topics					
11	Inadequate classroom space negatively affects the teaching of mathematics					
12	Teachers give learners feedback on class exercises in time					
13	Students do assigned mathematics homework					

14	The school provides sufficient resources to assist me in the teaching of mathematics					
15	The syllabus objectives are appropriate for upper primary mathematics					
16	The time allocated to mathematics lessons is enough to cover the syllabus content					
17	Parents support students with mathematics homework					
18	Teachers experience challenges in teaching mathematics					
19	Students get support from parents when they do mathematics homework					
20	There is a lot of support from colleagues in handling challenging topics in mathematics					

**SECTION B**

1. What impact do you think the availability of textbooks has on the achievement of mathematics by learners?  
.....  
.....  
.....  
.....
2. What are your views on the appropriateness of the textbook content in relation to the students?  
.....  
.....  
.....  
.....
3. Is the school doing enough in providing remedial programs in teaching of mathematics? Explain your answer  
.....  
.....  
.....  
.....
4. List remedial programmes that the school uses to improve the teaching of mathematics  
.....  
.....  
.....  
.....
5. What major challenges do you encounter in the teaching of mathematics?  
.....  
.....  
.....
6. How do you think the challenges you mentioned above should be resolved?  
.....  
.....  
.....
7. What is the impact of subject specialisation in the teaching of mathematics?

.....  
.....  
.....

8. What is the teacher-student ratio of your class? What is its impact on teaching of mathematics?

.....  
.....  
.....

9. Do you manage to cover the portion expected to be covered in the region mathematics syllabus? Please give reasons to your answer.

.....  
.....  
.....

b) Do you think there are effects of not finishing the syllabus?

.....  
.....

10. What has been done to improve the capacity of mathematics teachers?

.....  
.....  
.....

Thank you very much for your cooperation and time

Appendix B: Questionnaire for Learners

My name is Neo Natalie Mosekiemang, MEd Student of Mathematics Education at the University of Botswana. The purpose of the study for which the questionnaires are designed is to solicit your views regarding the challenges of teaching mathematics in upper primary. All the responses and the information you give will be treated with confidence and used for analytic purpose of the study. The questionnaire has two sections. Please give your response by placing a tick in the appropriate corresponding space in section A and by providing responses on the blank spaces in section B. Please be honest.

Research Topic: Challenges of teaching upper primary mathematics. (A case study in Mogoditshane primary schools).

School ..... Female.....  
 Standard ..... Male.....

SECTION A

Below is a list of 20 items. Please think about how you feel about each item and tick [✓] on the response that best describes how it applies to you. Please answer every question.

SA = strongly Agree; A = Agree; U = Uncertain; D = Disagree; SD = Strongly Disagree

	STATEMENTS	SA	A	N	D	SD
1	My teacher assists me during mathematics lessons					
2	I am normally given feedback on time after mathematics lessons					
3	Majority of topics in mathematics are difficult for me					
4	The time given for mathematics lessons is enough to complete exercises given to me					
5	Students are allowed to use calculators when doing mathematics					
6	I normally get support at home when doing mathematics					
7	There are enough mathematics textbooks to be used during mathematics lesson					
8	Our teacher sometimes gives mathematics activities to be done in groups or pairs.					
9	Teachers give learners time to work on mathematics exercises during the lesson					
10	Time given to mathematics lesson is enough to finish exercises given to us					
11	We are given mathematics homework regularly					
12	Teachers use teaching aids when teaching mathematics					
13	We play mathematics games at school					
14	I often use computers when learning mathematics at school					

15	Most of my classmates enjoy mathematics lesson					
16	Our mathematics teacher gives us mathematics homework most of the time					
17	We have regular study time for mathematics					
18	I normally get more than 50% in mathematics during end of term examinations					
19	There is a variety of mathematics resources I use beyond the textbook at school					
20	Insufficient textbooks in our class makes us fail mathematics					

**SECTION B**

1. List challenges that you normally encounter during the teaching and learning of mathematics.

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.....  
.....

2. How could the challenges mentioned above be solved?

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.....  
.....

3. Are there any remedial sessions meant to help you in learning mathematics?

.....  
.....  
.....

b) When are those remedial sessions done if there are any?

.....  
.....  
.....

4. List any mathematical equipment which you feel must be provided to you in order to help you to learn mathematics.

.....  
.....  
.....

b). Give topics which you feel are difficult for you to understand.

.....  
.....  
.....

5. Give any mathematical games that you normally play during mathematics lesson

.....  
.....

Thank you very much for your time and cooperation

## Appendix C: Interview Guide for Teachers

My name is Neo Natalie Mosekiemang, MEd Student of Mathematics Education at the University of Botswana. The purpose of the study for which the interview is designed is to solicit your views regarding challenges of teaching upper primary mathematics. All the responses and the information you give will be treated with confidence and used for analytic purpose of the study. Please be honest.

The interview will take around 30 to 40 minutes. Are you happy to take part in the interview? Do you have any questions before we start? Just to help me with what we will be discussing, is it ok to record our conversation?

The research topic is: Challenges of teaching upper primary mathematics. (A case study in Mogoditshane primary schools

### Challenges

- What challenges do you encounter when teaching upper primary mathematics?
- How do you think those challenges can be solved?
- Is there any in-service education programs you have undertaken at improving the teaching of mathematics in your school? Explain.

### Resources

- Which resources do you normally use to teach mathematics?
- Do you think those resources are enough to be used in the teaching of mathematics?
- What other resources do you think should be provided to help in teaching of mathematics?

### Syllabus

- Are teachers included in the development of the mathematics syllabus?
- What do you think must be done in the development of the syllabus?
- Is the content in the textbooks that you are using for teaching mathematics relevant for teaching mathematics?
- What is it that you feel must be changed in the textbook that you are using?

### Parental involvement

- Is there any support from parents in the teaching of mathematics?
- What support do you normally get from parents?
- How would you like to be helped by parents in teaching mathematics?



## Appendix D: Interview Guide for Learners

My name is Neo Natalie Mosekiemang, MEd Student of Mathematics Education at the University of Botswana. The purpose of the study for which the interview is designed is to solicit your views regarding challenges of teaching upper primary mathematics. All the responses and the information you give will be treated with confidence and used for analytic purpose of the study. Please be honest.

The interview will take around 30 to 40 minutes. Are you happy to take part in the interview? Do you have any questions before we start? Just to help me with information discussed, is it ok to record our conversation?

The research topic is: Challenges of teaching upper primary mathematics. (A case study in Mogoditshane primary schools).

### Challenges

- What is your view about mathematics?
- Do you like mathematics?
- What problems do you encounter when learning mathematics?
- What do you think must be done to help you succeed in mathematics?

### Home Support

- How often are you given mathematics homework?
- What challenges do you encounter when doing homework?
- Is there any support that you get from home when doing homework?
- What kind of support do you receive?
- What support do you get with other school work at home?

### Resources

- Do you have classrooms?
- What mathematics learning resources are available in your classroom?
- What mathematics learning resources do you wish should also be available in your classroom?
- Is there enough mathematics textbooks for your class?

Thank you very much for your time and cooperation

## Appendix E: Support Letter from Supervisor



### Faculty of Education

#### Department of Maths and Science Education

Corner of Notwane  
and Mobutu Road,  
Gaborone, Botswana

Pvt Bag 0022  
Gaborone,  
Botswana

Tel: [267] 355 5130  
Fax: [267] 318 5096  
e-mail [chakalis@mopipi.ub](mailto:chakalis@mopipi.ub)

25<sup>th</sup> April 2017

Permanent Secretary  
Ministry of Basic Education  
Private Bag 005  
Gaborone

Dear Madam

**Subject: Request for Permission to Conduct Research in Mogoditshane Primary Schools**

The bearer Ms Neo Natalie Mosekiemang of ID# 200904294 is a student at the University of Botswana enrolled in a Master in Education degree and currently undertaking ESM751: Research Essay in Mathematics Education. One requirement of the course is to undertake data collection on an identified research topic. Neo has an approved topic titled "**Challenges of Teaching Upper Primary Mathematics: A Case Study in Mogoditshane primary Schools**".

The candidate intends to collect data from sampled students and teachers in Mogoditshane. I wish to request permission to have the student undertake this exercise as planned. It is anticipated that the data collection will take place in the month of May 2017.

Kindly approve

Yours sincerely

Dr Paul A. Chakalisa  
**Student Supervisor - Math and Science Education**

cc Director, Kweneng Region



[www.ub.bw](http://www.ub.bw)

Appendix F: Letter from Ministry of Basic Education

TELEPHONE: 3655400/3655483  
TELEX: 2944 THUTO BD  
FAX: 3914271



MINISTRY OF BASIC EDUCATION  
PRIVATE BAG 005  
GABORONE, BOTSWANA

REF: DPRS 7/1/5 XXX (16) PAO-Research

17<sup>th</sup> May 2017

Mrs Neo N.Mosekiemang  
PO Box 20829 Ntshinoge  
Mochudi

Dear Madam

**RE: PERMIT TO CONDUCT A RESEARCH STUDY**

This serves to grant you permission to conduct your study in the sampled areas in Botswana to address the following research objectives/questions /topic:

**Challenges of teaching Upper Primary Mathematics: a case study in Mogoditshane Primary Schools.**

It is of paramount importance to seek **Assent** and **Consent** from the Director of Kweneng, School Head, teachers, parents and students of sampled Mogoditshane Primary Schools that you are going to collect data from. We hope that you will conduct your study as stated in your proposal and that you will adhere to research ethics. Failure to comply with the above stated, will result in immediate termination of the research permit. The validity of the permit is from **17<sup>th</sup> May 2017 to 16<sup>th</sup> May 2018**.

**You are requested to submit a copy of your final report of the study as stated in the Research Guidelines (para 4.5 - 4.6, 2007) to the Ministry of Education and Skills Development, in the Department of Educational Planning and Research Services, Botswana.**

Thank you.

Yours faithfully

A handwritten signature in blue ink, appearing to read 'Sir Wonder Masebola'.

Sir Wonder Masebola  
For/Permanent Secretary

MoESD CONTACT CENTRE  
16885 | moesd16885@gov.bw | Private Bag 005 Gaborone



Appendix G: Letter from Mogoditshane /Thamaga Sub Region



(267) 3914108



Republic of Botswana

MOGODITSHANE/THAMAGA SUB-REGION  
PRIVATE BAG 047  
MOGODITSHANE  
BOTSWANA

FAX: (267) 3956580

REF: 992025206

31<sup>st</sup> May 2017

Dear Ms. Neo Mosekiemang

**Permission to conduct research study:**

Reference is made to your letter dated 31<sup>st</sup> May 2017 with regard to the above subject matter.

Permission is hereby granted to you to conduct a research study in the sampled Schools. You are therefore requested to liaise with the concerned School heads who will assist you.

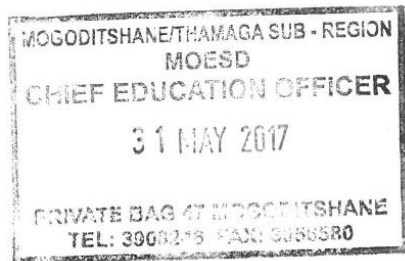
Please note that all professional ethics should be applied during your research study.

Yours faithfully,

**E. LEBANNA**

**For/Chief Education Officer – Mogoditshane/Thamaga Sub-Region**

**Cc: School head**



Appendix H: Letter to the Head Teachers

University of Botswana  
Private Bag 0022  
Gaborone  
09 May 2018

The Head Teacher

-----  
-----

Kweneng

Dear Sir / Madam

RE: Request to conduct a research project in your school.

I am a University of Botswana post graduate 3rd year student. I am requesting to carry out a research as a partial fulfilment of Masters of Education. I therefore request a permission to carry out my research in your school. My research topic is “challenges of teaching upper primary mathematics.”

Your cooperation is highly apprehended.

Yours Sincerely

-----

Neo Natalie Mosekiemang

Cc: Dr. P Chakalisa (Supervisor: University of Botswana)

Appendix I: Consent Form

P O Box 20829  
Mochudi  
Ntshinoge  
Mobile No: 71384648/ 76835119  
Email: [neomosekiemang@gmail.com](mailto:neomosekiemang@gmail.com)

09 May 2018

Permanent Secretary  
Ministry of Basic Education  
Private Bag 005  
Gaborone

Dear Sir/Madam

**RE: REQUEST FOR A PERMIT TO CONDUCT RESEARCH STUDY IN MOGODITSHANE  
PRIMARY SCHOOLS**

My name is Neo Natalie Mosekiemang. I humbly request for a permit to conduct a research study from Mogoditshane primary schools. My research topic is challenges of teaching upper primary mathematics. (A case study in Mogoditshane primary schools). The intention of my study is to find out the challenges faced by teachers of upper primary mathematics and find solutions to all the identified challenges. My student identity number is 200904294 and I am pursuing Masters in Department of Mathematics and Science Education (Mathematics Education). I would be grateful if a positive consideration is given on this matter

Yours faithfully

---

Neo Natalie Mosekiemang (Ms.)

Appendix J: Letter to Principal Education Officer 2 (Kweneng Inspectoral Area)

P O Box 20829  
Mochudi / Ntshinoge  
29 May 2018

Principal Education Officer 2  
Kweneng Inspectoral Area  
Kweneng  
Dear Sir/Madam

RE: REQUEST TO CONDUCT A RESEARCH PROPOSAL IN YOUR SCHOOLS

I am a University of Botswana postgraduate 3<sup>rd</sup> year student. I am requesting to carry out a research proposal as a partial fulfilment of Masters of Education. I therefore request permission to carry out research in Mogoditshane primary schools. My research topic is “challenges of teaching upper primary mathematics.” Attached is a copy from ministry of education as well as a letter from University of Botswana.

Your cooperation is highly appreciated.

Yours Sincerely

-----

Neo Natalie Mosekiemang (Ms)  
Cc: Dr. P Chakalisa (Supervisor: University of Botswana)

Appendix K: Consent Form for Participants

Project title: Challenges of teaching upper primary mathematics (A case study in Mogoditshane primary schools).

Researcher: Neo Natalie Mosekiemang Contact information: cell number 71384648 OR 76835119. Email; neomosekiemang@gmail.com

About the research

- Participation in this research is voluntary, you have the right to refuse to partake in it.
- If you agree to partake in the study, you may withdraw at any time if you are not comfortable.
- You are advised to go through this consent form before making a decision to partake in the study.

Procedures and requirement

Upon making a decision to partake in this study you will fill a questionnaire and be invited to participate in an interview session.

Purpose

The purpose of the study is to establish challenges of both teachers and learners in the teaching and learning of mathematics at upper primary school level in Botswana (Kweneng) in Mogoditshane primary schools. The study also identifies the strategies teachers and learners use to address the challenges they encounter in teaching and learning upper primary mathematics.

Risks and discomforts

There are no known risks for taking part in this study. There is a possibility that one may be subjected to risks and discomforts that may have not been identified.

Benefits and compensation

The findings of this study would shed light on how to achieve quality education in comparable schools in the department of primary in the Ministry of Basic Education. The study might also provide insight into the problems whose solution might help inform specific actions to be taken to efficiently and effectively address the poor performance in mathematics in schools. The study will also provide strategies to guide teachers on how to improve performance of learners to a level that would allow them entrance in secondary level.

Confidentiality and privacy

All the information you provide will be confidential, and it will be used for this research only and no other research apart from this one. Your identity will not be revealed to anyone. Data generated from this research will not be used for any commercial purposes.

Voluntary participation

Your participation in this study is strictly voluntary, you may decide to withdraw from this study at any time without any penalty.

Authorization

You are making a decision to either partake in this study or not. If you decide to partake please fill in your name and surname on the space provide as well as your signature.

.....

.....

Name of the research participant

.....

.....

Date administered



You will be given a copy of this consent form to keep

If you have any questions concerning this study or consent from beyond those answered by the investigator, including questions about the research, your rights as a research participant: or if you feel that you have been treated unfairly and would like to talk to someone other than the researcher, please feel free to contact Dr P Chakalisa at University of Botswana. Email; [chakalis@mopipi.ub.bw](mailto:chakalis@mopipi.ub.bw). Tel: (267) 3555130. Fax: (267) 3185096