EARLY INTERVENTION OF MATHEMATICS DIFFICULTIES AND PERFORMANCE OF STANDARD THREE PUPILS IN PRIMARY SCHOOLS IN BUTERE SUB-COUNTY, KENYA

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DECLARATION

I declare that this thesis is my original work and has not been presented to any other university for consideration. This thesis has been complimented by referenced sources duly acknowledged. Where text, data, graphics, pictures or tables have been borrowed from other sources, including the Internet these are specifically accredited and referenced in accordance with anti-plagiarism regulations.

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This work is dedicated to my family; my wife and friend: Idah Asisi Wafula, Daughter: Zawadi Jedidah (Dr) and Son : Alpha Prince Jedaya (Justice) .

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ACRONYMS/ABBREVIATIONS

B.ED	-	Bachelors of Education Degree
CPE	-	Certificate of Primary Education
EAACE	-	East African Advanced Certificate of Education
EACE	-	East African Certificate of Education
EAHCA	-	Education for All Handicapped Children Act
EARC	-	Educational Assessment and Resource Centre.
ECD	-	Early Childhood Development
EFA	-	Education For All.
H.I	-	Hearing Impairment.
ICLD	-	Integrity Committee on Learning Disabilities
IDEA	-	Individual with Disabilities Education Act
IEP	-	Individualized Educational Programme
IQ	-	Intelligence Quotient
KACE	-	Kenya Advanced Certificate of Education
KAPE	-	Kenya Advanced Primary Education
KCE	-	Kenya Certificate of Education
KCPE	-	Kenya Certificate of Primary Education
KIE	-	Kenya Institute of Education.
KJSE	-	Kenya Junior Secondary Education
KPE	-	Kenya Primary Education
M.D	-	Mathematics Difficulties.

MDGs	-	Millennium Development Goals
M.ED	-	Masters of Education Degree
M.R	-	Mental Retardation.
MKO	-	More Knowledgeable Other
NCLB	-	No Child is Left Behind
NJCLD	-	National Joint Committee on Learning Disabilities
NRP	-	National Research Panel
P1	-	Primary Teacher Grade One
SLD	-	Specific Learning Disorder
ZPD	-	Zone of Proximal Development

ABSTRACT

Mathematics skills are not only a basic requirement for every member of the society to productively engage in everyday activities but also a universal language that finds meaning in all cultures and civilizations. Every tribe, culture and social group thinks and communicates ideas through quantities. Mathematics education is to a nation what protein is to a young human organism. It is not only a vital tool for the understanding and application of science and technology but also a great determinant of the kind of courses children take at all levels of learning. However, poor mathematics performance in the national examinations has been of great concern to the educationists and the society at large. Factors such as students' negative attitude to mathematics and high pupil teacher ratio due to Free Primary Education have been attributed to this. However, research studies indicate that six to ten percent (6-10%) of primary school age children in the US experience Mathematics Difficulties which make them struggle a lot in their education. In Kenya, about 20% of learners in primary schools experience Learning Difficulties (LD) in mathematics. These learners achieve poorly in mathematics, their self esteem may be lowered, may become truants and drop out of school. In spite of these, studies reviewed only sought to establish the number of learners experiencing LD in Mathematics and Language and possible factors that influenced the early identification of LD. This study was designed to establish if there was early identification and remedial teaching for children with Mathematics Difficulties in lower primary schools in Butere district. The effect of this remedial teaching on children's achievement in mathematics was also investigated. The study was done in Butere district Kakamega County. Descriptive survey and Quasi-experimental designs were used in this study. Stratified and purposive sampling was also used to select eighty learners with Mathematics Difficulties and eight standard three teachers of the identified schools. A questionnaire was administered to class three teachers and a pre and post experimental test was administered to the pupils in the experimental and control groups. The collected data was coded and analyzed using the Statistical Package for Social Sciences (SPSS). Descriptive statistics such as frequencies, means and percentages were calculated. The t- test calculated was 4.38 with a $p< 0.001$ level at an alpha $p< 0.05$. The p value was less than $p< 0.05$ meaning the result was quite significant and hence the null hypothesis was accepted. This meant there was a significant difference in mathematics performance of pupils with MD who received remedial teaching from those who did not. It was also established that teachers identified pupils with MD, more boys had MD than girls; learners experienced MD in addition with carrying and subtraction with borrowing. Schools mostly conducted paid tuition and not remedial teaching for pupils with MD. The tuition was conducted in the afternoons and during school holidays. There was no significant difference in mathematics performance of pupils with MD neither in public or private schools nor between boys and girls with MD who received remedial teaching. Therefore, it was recommended that MOEST formulate a policy that supports early identification of pupils with MD and give remedial teaching to mitigate the disability. KICD should develop appropriate curriculum and remedial teaching programme for pupils with MD.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Learning in the twenty first century does not only require to equip children with basic education in numeracy but also advanced complex mathematical skills for living and that can serve as a foundation for a successful future career in life (UNICEF, 2001). This is because mathematics is a universal language that has meaning in all cultures and civilizations. Every culture, social class and ethnic group thinks about, record and communicate ideas through quantity (Learner, 2006). Consequently, mathematics is widely regarded as one of the most important subjects in the school curriculum. The whole world regards mathematics as important and is probably the only subject that is taught practically in every school in the world.

As a matter of fact, it would be very difficult perhaps impossible to live a normal life without making use of mathematical skills of some kind. This is because mathematics is used as a filter or hurdle possibly more than any other subject for entry into not only to a good secondary school but also in the selection of courses at the university and other institutions of higher learning (Cockroft, 1982; Jordan, 2010). Therefore, it would be very important that all students have an opportunity and the necessary support to learn mathematics with depth and understanding not only for their academic success but also for their career pursuit.

However, mathematics performance has consistently been very poor in national examinations. The failure has consistently been above 50% and the case seems to worsen with time. For instance, the failure rate in mathematics at KCSE in 1999 was at 79% as reported by KNEC in (Miheso, 2002). This case has not even improved much to date. For instance, a national survey was conducted by Uwezo Kenya (2010) to assess the literacy and numeracy levels among Kenyan children age 6-16. The study revealed that almost half of class three pupils and about a quarter of pupils in class four to seven in Kenya could not compute class two sums. This meant that most pupils in both lower and upper primary classes lacked the necessary mathematics skills to move to the next level. Consequently, many pupils were moving from one class to another and possibly graduating from primary schools without the necessary mathematical skills to succeed in their future career pursuits courtesy of the government ban on forced repetitions.

The Kenyan primary mathematics curriculum anticipates that foundational mathematics skills and concepts like numeracy and mathematics operations/computations are supposed to be done in classes 1- 3 (lower primary section). Hence during this period in lower primary, basic foundational computation processes are supposed to be established and learners equipped with the basic skills pertinent to learning mathematics throughout primary and other levels of education (Arasa, 2004). Therefore, failure to lay a stable foundation in essential mathematics processes may lead pupils not only struggling in mathematics but may also not succeed in their future career. However, effective

identification and early intervention also occur during this period, hence the need for this study.

After class three, the mathematics learned earlier is reinforced and expanded on with more complex concepts. Moreover, since the 8-4-4 system is spiral in nature, achieving basic computations skills plus mathematics operations in lower primary is not only of critical importance for success in school but is also one of the primary ways of learning (JKF, 2003; KIE, 2010). However, some research studies indicate that there is inadequate teaching/ learning of mathematics in the regular primary schools that could lead to Mathematics Difficulties. For instance, the Kenya National Examination Council (KNEC, 2010) conducted a National Survey on Learning Mathematics and Sciences (NASMLA) to establish the effectiveness of Learning of Sciences and Mathematics in lower primary schools. The study revealed that there no effective means of learning of science and mathematics in the public primary schools due to factors such as overcrowding in our public primary schools. One class was holding as many as sixty children under one teacher. The other factors included; poor teaching methods such as talk and chalk to practical learning and high incidences of teacher absenteeism causing artificial shortage of teachers.

Despite the poor the performance of mathematics in exams, the influence of Mathematics Difficulties on pupils' performance in mathematics in Kenya may not have been explored. Mathematics difficulties is a difficulty in learning

mathematics number concepts and operational skills. This is despite a child having adequate intelligence, has no sensory, motor nor neurological problems. The number of children experiencing MD is significant. For instance, about 8-20% of school children in the regular primary schools in the US and India suffer from MD (Jordan, 2010 & Prakash, 2008). In Kenya, 20- 24% 0f children in the regular classes suffer from MD (Kinyua, 2007; Wafula, 2009 & Uwezo, 2010). Unfortunately, the classroom teacher, teacher educators, school administrators and parents may not be well informed about this problem. Consequently, these children are promoted from one class to another under the no forced repetition policy, even though they have not mastered the necessary mathematics skills for the next level. This therefore, justifies the need for early identification and intervention of MD.

This is because Mathematics Difficulties are persistent and may make the learners never to catch up with their normally achieving peers unless remedial teaching is done (Jordan, 2010). Moreover, the consequences of Mathematics Difficulties are dire as revealed in a study conducted by Rivera-Batiz (1992). MD may cause low mathematics achievement which is not only serious for the learners' everyday functioning but also affects their educational attainment. Learners develop fear for mathematics thus limiting their academic and career possibilities. MD also hamper children's daily life activities like; management of finances. Hence the need to establish if teachers had remedial teaching program and establish its influence on the achievement of pupils with MD.

An evidence based argument for early identification and intervention indicates that early intervention of mathematics Difficulties leads to approximately18% percent recovery of the children at risk (Lyon, 2001). Effectiveness of early intervention can also be seen in a study done by Amateshe (2011) on intervention techniques for children with Down Syndrome and Cerebral palsy in Maria Magdalena special school Thika. The aim was to investigate speech development and intervention techniques of children with Down Syndrome and Cerebral palsy. The study revealed that intervention awakened children's speech perception skills and that the use of concrete materials promoted understanding of concepts in children. This literature therefore, points to the need to give remedial teaching for pupils with mathematics difficulties and thereafter establish the impact of the remedial programme on mathematics performance for pupils with MD. This is because successful remediation enables them achieve necessary educational and employment requirements.

Though the foregone studies revealed how MD impaired children's careers and future academic prospects, MD has received far less attention in early intervention than reading disabilities in the US (Dowker, 1998; Geary, 2000). One of the explanations for this disparity according to Garnett (1998) is that, children identified with Mathematics Difficulties seldom get substantive assessment and remediation. Consequently, early intervention of Mathematics Difficulties is far less common than that in reading difficulties in the US (Jordan, 2010). The

situation in Kenya may not be different. Hence the need establish if there is remedial teaching for pupils with MD and how the remedial teaching impacted on the mathematics performance of children with MD. This is because mathematics failure may adversely affect the child's self-image and feelings of competence. It may also be a probable cause for truancy, juvenile delinquency, anxiety and lack of motivation. Since we live in a mathematical world, some level of mathematical thinking and problem solving is needed in our day to day living (National Council of Teachers of Mathematics, 2000) failure to which the learners daily living activities are hampered with. In addition, mathematics is one of the major components for consideration of entrance to high school, mid-level colleges, university and the kind of course the learner pursues. Therefore, failure in mathematics does not hamper the child's future education but also the kind of course they take (Jordan, 2010). Thus this study endeavored to find out if there were remedial programmes for learners with Mathematics Difficulties in class three and how the remedial teaching influenced the pupils performance in mathematics in Butere district; Kakamega County. This is because remedial teaching programmes formed a firm foundation upon which successful mathematics intervention is anchored.

1.2 Statement of the Problem

Mathematics is widely regarded as one of the most important subjects in the school curriculum. The whole world regards mathematics as important and is probably the only subject that is practically taught in every school in the world.

As a matter of fact it would be very difficult perhaps impossible to live a normal life without making use of mathematical skills of some kind. This could be attributed to the fact that mathematics is used as a filter or hurdle when selecting courses in the middle level colleges or university possibly more than any other subject. It is also a major consideration for entry into not only to a good secondary school but is also a major requirement in the selection of especially science related courses. Therefore, it is important that all students have an opportunity and the necessary support to learn mathematics with depth and understanding to enable them succeed in their academic achievement which is an important parameter in measuring success in students in Kenya and the world at large.

However, there has been persistently poor performance in mathematics by students at almost all levels in educational institutions in Kenya. For instance, the national failure rate in mathematics at KCSE in 1999 was at 79% as reported by Miheso (2002). Kakamega County is not an exception to this poor performance. For instance, a study done by Uwezo Kenya (2010) revealed that almost half of children in class three in Kakamega County were unable to compute class two sums. One of the badly hit sub counties include Butere Sub County where about 22% of children in STDs 4- 7 in the regular primary school could neither identify numbers 10-99 nor compute class two mathematics. Moreover, almost a quarter of the children in class three could not compute class two mathematics. This means these children lacked basic numeracy skills to move to the next class though through the “no repetition policy” many of these low achieving children

are given a blank chaque of promotion to the next class despite this poor performance in mathematics (Uwezo, 2010). The consequence of this was weaker foundational setting in the lower primary classes leading to persistently poor performance in the KCPE exams. This is because fundamental mathematical skills are supposed to be laid in Lower primary; failure to which the learners end up doing badly in mathematics at the national exams when in upper primary. For instance, there has been consistently below average mathematics scores in Butere sub county dating back to five ago. These were the scores; 40.35 (2009), 41.66 (2010) 45.73 (2011), 44.68 (2012) and 49.60 in the (2013) KCPE exams (MOEST, 2014). Several reasons have been cited for this poor performance. For instance, according to the KNEC report (2010) many children were performing poorly in mathematics because their teachers were regularly absent from school t leading to a low syllabus coverage. Teachers used poor teaching methods (teacher centered) and classes were overcrowded due to FPE hampering effective teacher pupil interaction during the learning process. These affected foundation setting in lower primary leading to many children experiencing MD. However, the influence of MD on poor mathematics performance has not been considered though it is very critical. This is because MD is caused when foundational mathematical skills are poorly laid down in class three causing poor mathematics processing skills which is an aspect of MD. Studies reviewed indicated that effective remedial teaching could be achieved if done in class three. Therefore, this study wanted to establish if class three teachers identified pupils with MD (experiencing learning Difficulties in pre operational and operational skills), if

they had remedial teaching for children identified with MD. The researcher will then conduct screening tests for MD, administer a remedial teaching program for MD and establish the influence of the Remedial teaching on the mathematics perfomance of pupils with MD who received Remedial teaching. This study was done in the regular primary schools because most children with MD are in regular primary schools and hence the need to promote inclusive education as compared to establishing many special schools.

1.3 Purpose of the Study

The purpose of this study was to find out if class three mathematics teachers identified pupils with Mathematics Difficulties and establish remedial teaching programs they had for pupils with Mathematics Difficulties. The study was also to determine the effect of remedial teaching program on mathematics performance of learners with Mathematics Difficulties.

1.4 Objectives of the Study

The objectives of this study were to:

i) Find out if there was early identification of children with Mathematics Difficulties in Butere District.
ii) Establish the common forms of Mathematics Difficulties experienced by pupils with MD in Butere District.
iii) Find out if there was remedial teaching for pupils with mathematics difficulties in lower primary schools.

iv) Administer a remedial teaching program and establish the effect of the remedial teaching program on pupils' mathematics performance (achievement).

1.5 Research Hypotheses

The following were the research hypotheses of the study;

Ha1: There is a difference in mathematics performance between pupils with mathematics learning difficulties who receive remedial teaching and those who do not.

Ha2: There is a difference in performance between boys and girls with mathematics difficulties who receive remedial teaching.

Ha3: There is a difference in mathematics performance between pupils with mathematics difficulties in public and private primary schools who receive remedial teaching.

1.6 Significance of the Study

This study was to establish if teachers identified and provided remedial teaching to children with MD. The effect of the remedial teaching was also to be investigated. The Ministry of Education (MOE) may use the findings of the study when formulating policies to enhance early identification of MD and intervention programmes for learners with Mathematics difficulties.

The Kenya Institute of Curriculum Development (K.I.C.D) may also use the findings of the study when developing assessment tool for MD. Teacher trainers may use the findings of the study to equip teacher – trainees with relevant knowledge and skills on early identification and intervention of mathematics difficulties. The findings of this study may also sensitize the curriculum developers and other stake holders to appreciate the importance of early identification and intervention of mathematics difficulties for improved general academic performance of learners with learning disabilities. The study may also yield relevant data that may inform future policies on stable parent-teacher collaborations in the intervention of mathematics difficulties.

1.7.0 Delimitations and Limitations of the Study

They are described in the following subsections:

1.7.1 Delimitations of the Study

Mathematics Difficulties affect people of different ages. This study focused on learners of nine years and below because reviewed studies indicate that most successful intervention occurs during this age. Secondly, intervention methods used may differ between public and private schools. Therefore, this study focused on both public and private primary schools in Butere district. Factors influencing early intervention of mathematics difficulties amongst class three pupils might vary from region to region. This study was conducted in Butere District. The results may not be generalized to other districts that are not similar to it. The study

was focused on standard three children with mathematics difficulties from the sampled public and private primary schools in Butere district. Though mathematics difficulties do not only affect children in primary schools, but also those in high school and post secondary institutions, this study confined itself to mathematics difficulties among children in lower primary schools (9 years) where effective early identification and intervention occurs.

1.7.2 Limitations of the Study

The study was limited by financial and time constraints which could not allow the study to cover all primary schools in the county so that the results can be generalized to schools in the whole county. However, the researcher raised funds by securing a loan to implement the activities of the work plan and payment of fees. The teachers strike over salary grievances almost delayed the study but a quick intervention from the government saved the situation.

1.8 Assumptions of the Study

The researcher made several assumptions which guided the study. Firstly, it was assumed that there are children experiencing Mathematics Difficulties. Secondly, it was assumed that the teacher training course equips teachers with basic knowledge and skills on how to identify pupils with MD. Thirdly, it was assumed that there is a difference in implementation of the remedial teaching program between private and public primary schools. Lastly, it was assumed that there are a range of factors that influence the effect of remedial teaching for pupils with

MD and that early intervention can help mitigate Mathematics Difficulties among class three pupils.

1.9.0 Theoretical and Conceptual Framework

The study adopted the Social Cultural theory of Lev Vygotsky (1978) which stipulated that social interaction led to continuous changes in children's thought and behavior. He also suggested that children's development depended on interaction with More Knowledgeable Others (MKO) in a nurturant learning environment and the social tools provided to them especially language (Vygotsky, 1978).

1.9.1 Theoretical Framework

This study was guided by the social cultural theory on learning by Lev Vygotsky because it states that learning effectively takes place through scaffolding when the child's Zone of Proximal Development (ZPD) is raised. ZPD refers to what a child can do independently and when solving problems under an adult's guidance (teacher) or in collaboration with more capable peer (Vygotsky, 1978) in a group set up. Therefore, a learner with MD working under the guidance of a teacher or peers in an area they are experiencing difficulty will have a higher performance than when working alone (Deborah, 2001) because they will receive support and explanations that improves their understanding and solving of the otherwise difficult sums. Secondly, the pupil with MD can be scaffolded to better performance. This means that a child with MD taught in a warm cordial and

supportive environment will perform better than when in a harsh environment. Hence the need to establish remedial teaching strategies used and their ultimate impact on the mathematics performance of a child with LD.

Thirdly, the use of language used in communication should be developmentally appropriate and concretized. The use of pragmatic language such as put together instead of addition, take away instead of subtraction and sharing in equal portions instead of division. The concrete language enhances understanding because children are in Piagetian concrete stage. (Chad, 2007) and learn best through manipulation of tangible materials, a concept greatly advanced by the remedial teaching program. Therefore, the role of the teacher in this social interaction or merely facilitating learners with materials to actively participate in learning. The teacher also give learners simplified tasks that are broken into smaller subtasks, focus the learners on the most important ideas of the assignment so as to scaffold the learners complete their tasks successfully (Preston, 1993 ; Vygotsky, 1962)). This makes the learners to overcome frustrations that arise from failure.

Also, a struggling student can be paired with a more capable one to help the struggling student become competent (Richard, 2004). Concerning the curriculum, Vygotsky (1978) suggested that it should provide more opportunities for learners to apply the already learnt concepts and challenge their competence. Hence the suitability of this theory in giving effective remedial teaching program for pupils with MD. Finally, Vygotsky recommended inclusive education for

children with disabilities (Gindis, 1999) to avoid social stigmatization and failure resulting from lack of scaffolding (Tudge, 1990). Teachers therefore, ought to have a capacity to teach children with special learning needs so as to enable them benefit from school instructions (Luise, 1990). However, this raises a pertinent question, are teachers in the regular schools trained to handle learners with special needs and is the teacher-pupil ratio reasonable to enable the teacher be effective (Vygotsky, 1962) in teaching the children with special needs This explains why the study was done in the regular primary schools as a way of promoting integration or inclusive education. In a nut shell, the rationale for using this theory is because scaffolding according to Neuman & Roskos (1993) is like a remedial teaching conducted by an adult or a more competent peer to raise the competencies of the child with MD to succeed in activities that are slightly beyond their ability. Furthermore, ideal interactions between a more knowledgeable adult (teacher) and child with MD due to ideal teacher-pupil ratio in a remedial programme enhance the learning of a child with mathematics difficulties. This is because of a closer interaction between the teacher and the pupil which improves their understanding of concepts leading to improved scores in mathematics. In addition to that, an interactive curriculum is recommended to enable the child interact well with the tasks given by the teacher. The individualized learning tasks, regular practice and suitable instructions given in a language best understood by the child enhance mental development which in turn results in high mathematics achievement. Hence there was need to find out if there was remedial teaching programme for pupils with MD, the impact of the

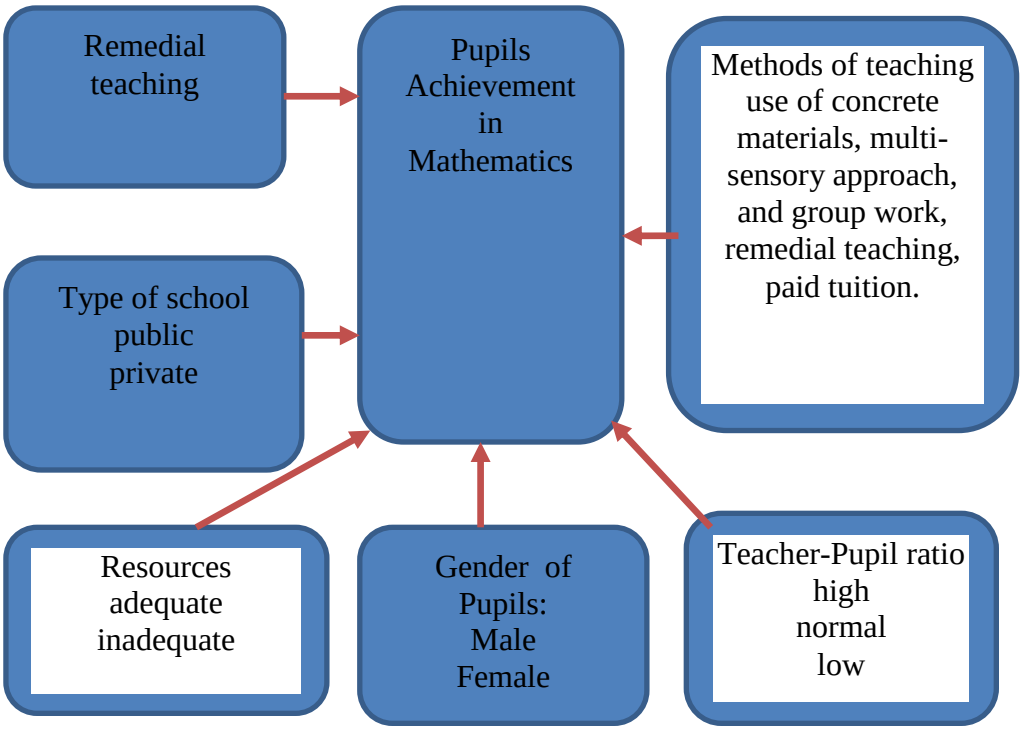
remedial teaching on the performance of pupils with MD in mathematics as well as factors that influenced the impact of the remedial teaching programme on the mathematics performance of pupils with MD.

1.9.2 Conceptual Framework

Vygotsky's theoretical orientation leads to a social approach in which learning takes place through two important tools, namely; ideal interaction processes and ideal language of instruction. Learning takes place where there is quality interaction between an experienced adult (trained teacher) and the child. The teachers' role is to scaffold the child with mathematics difficulties by giving them remedial teaching lessons which have simplified tasks, involving the learners' actively in learning and focusing their attention to the main ideas of the lesson for better understanding. A trained teacher uses developmentally appropriate language of instruction and learning activities to enhance learning of mathematics concepts. Ideal intervention is also dependent on an ideal Teacher pupil ratio.

Therefore, there are two levels of variables involved in the early intervention of mathematics difficulties. These factors include ideal teacher- pupil interactions and effective teaching strategies (Remedial teaching programme).

Figure 1: A conceptual Framework Diagram



The figure shows the influence of remedial teaching on mathematics performance of pupils with MD and the interplay of pupils' gender, the type of school they learnt in, the ration of the teacher- pupil and the adequacy of learning materials on the achievement of children with MD who received remedial teaching.

1.10 Operational Definition of Terms

Early intervention of mathematics difficulties - This refers to the use of special teaching techniques to enable pupils MD overcome difficulties such as forming concepts or faulty learning habits with the aim of improving their mathematics performance.

Experimental and Control groups - The Experimental group refers to the group of pupils with Mathematics Difficulties who were given remedial teaching whereas the Control group refer to pupils with Mathematics Difficulties who were not given a remedial teaching and thereafter the two given post test to see effect of remedial training.

Mathematics difficulties - These refers to a extrinsic condition that lies in the child's environment; inappropriate instruction and lack of ideal reinforcement making a pupil have poor mental representation of quantities resulting to specific disabilities in a basic numerical processing and intuitions for quantities despite having adequate intelligence and has no gross sensory, motor and neurological problems.

Remedial Teaching programme - This refers to the application of special teaching techniques to overcome difficulties in

learning for instance; difficulties in forming concepts or faulty learning habits so as to enable them grasp the concepts like their normally performing peers and perform better in mathematics.

Screening tool - This will refer to a pre-test exercise given to learners to enable teachers to know whether the learners experience in Mathematics Difficulties or not. The Samveda Research Training Centre Tool for Learning disabilities was used (SRTCT).

Type of school - This refers to whether the school is public or private.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents early identification of children with mathematics difficulties, methods of identifying pupils with MD, forms of mathematics difficulties, remedial teaching for pupils with MD, effects of the remedial teaching on pupils performance, Selective factors that influence early identification and intervention of MD (Type of school, Gender, teacher pupil ratio and training in SNE) and summary of the literature reviewed.

2.2 Early identification of Children with Mathematics Difficulties

According to Kirk (1962) MD is a condition in which children manifest inadequate development of mathematics skills and competencies leading to unexpected underachievement even when they have adequate intelligence, have no gross sensory, motor or neurological problems causing a significant discrepancy between what the child has the potential to do and what they are doing (Mercer, (1992).

According to Dumont (1994) and Carmine, Jitendra & Silbert (1997) a pupil exhibiting MD may not be having any intellectual impairment but may have been subjected to inadequate instruction of curriculum content making the child have difficulty in learning the basic skills of arithmetic despite having adequate intelligence and has no gross sensory, motor and neurological problems.

Butterworth (2005b) and Wilson & Dehaene (2007) state that Mathematics Difficulties may be the result of a condition that is extrinsic and lies in the child's environment; inappropriate instruction and lack of ideal reinforcement causing a poor mental representation of quantities resulting to specific disabilities in a basic numerical processing and intuitions for quantities (Chadha, 2001). Therefore, the study sought to answer this pertinent question 'Is there early identification and remedial teaching for pupils with MD how effective is the remedial teaching in improving the mathematics performance of class three pupils with MD in Butere District?

How prevalent are Mathematics Difficulties?. Mathematics Difficulties are found in all nations, tribes and civilizations across the world (Learner, 2006). It is reported in studies done by Desoete (2007) and Geary (2004) that approximately 5-8% of learners in the US primary schools experience MD. Another study was conducted by Jordan (2010) on early predictors of mathematics achievement and Mathematics learning in USA involving preschool children to class three pupils. The study was aimed at finding out how kindergarten numeracy is related to counting, numerical magnitude comparisons, non verbal arithmetic, verbal arithmetic and how it will predict mathematics rate of achievement in classes one to three. The findings of the study revealed that mathematics difficulties are widespread in the USA. About six to ten percent (6-10%) of school age children experience difficulties in learning mathematics at some point in their school careers even though they are not of low intelligence and do not suffer from educational deprivation. Many more learners struggle in mathematics without

formal diagnosis. These difficulties are persistent, and learners who have difficulties may never catch up with their normally achieving peers. This study therefore, sought to establish the number of pupils identified with the public and private primary schools of Butere District.

Consequently a study was done in Kenya by Kinyua (2007) on Seeking Ways to Promote Parent-Teacher Collaboration in providing Education for learners with LD in Kasarani Division of Nairobi County. The findings of the study revealed that there were about 20% learners having LD in the regular primary schools. However, most regular class teachers lacked not only the necessary skills to identify learners with LD but also to offer early intervention. Pupils with Mathematics Difficulties formed a larger part of pupils identified with Learning Disabilities. Another study conducted by Wafula (2009) on Early Identification of Class Three Pupils with LD in the Public Primary Schools in Butere revealed that about 24% of children enrolled in the public primary schools had Learning Disabilities. According to this study also, most learners experienced MD than language related difficulties. Hence the need to find out if teachers had remedial teaching programmes for these pupils.

Further still, a study done by Uwezo Kenya (2010) entitled Are Our Children Learning aimed at establishing how learners acquired basic numeracy skills in Kenyan primary schools. The findings of the study revealed that about 22% of learners in the primary schools in Butere experienced mathematics difficulties. Most classes were overcrowded with over sixty children against one teacher. This

study therefore seeks to establish whether teachers had remedial programs for these learners and to what extent is this remedial program helping the learners in overcoming mathematics difficulties as well selective factors that influenced effective early intervention of MD such as pupil teacher ratio.

According to Jordan (2010) on early predictors of mathematics achievement and mathematics learning difficulties, mathematics difficulties are pervasive and have lifelong consequences to the learners. Nonetheless, early intervention of mathematics difficulties is far less common than in reading. It has equally and received far less attention than learning disabilities in reading (Dowker, 1998 & Geary, 2000). Consequently, the study seeks to find out if there is remedial teaching for pupils with MD and how this remedial teaching influences the mathematics performance of pupils with MD.

However, studies by Lyon (2001) reveal that about seventy percent (70%) of learners with Learning Difficulties who are given Remedial Teaching experience recovery in their performance. Also, early identification leading to intervention builds the learners' capacities to enable them take full advantage of their later educational opportunities. The child is empowered to cope with the condition and boosts not only their self acceptance but also their self esteem and awareness. In addition to that, the child's family is enlightened on how to get involved in the child's education throughout the entire intervention process.

The parents' esteem towards the child and themselves is greatly boosted and thus enabling them become better teachers in support of their child's education. With the intervention before nine years of age the development gains are greater. The earlier the intervention, the more effective it is. (Learner, 2006 & KISE, 2007). Therefore, this study endeavored to establish the age of pupils with MD so as to determine whether there was delayed school enrolment or forced repetition which could make the pupils outgrow the ideal age for effective early intervention of MD.

Moreover, research data also show that parents of learners with mathematics difficulties need the skills and support to scaffold their children's education. Outcomes of family intervention include: the parent's ability to monitor the child's learning at home and thus reduce the failure that affects the education of the child (Chadha, 2001).Therefore, this study sought to find out parents occupation and education level which according to the literature reviewed greatly affect the child's academic performance. In addition to that, early identification of Mathematics Difficulties provides support for screening, intervention and progress monitoring before the learner fall seriously behind in school (Jordan, 2010). The consequences of poor mathematics achievement are serious for everyday functioning, educational attainment, and career advancement. Mathematics competence is necessary for entry into science related courses. Mathematics difficulties are pervasive and can have lifelong consequences (Jordan, 2010). Hence the need to find out if teachers identified children with

MD, if they gave Remedial Teaching and how the remedial teaching influenced the mathematics performance of pupils with MD.

In the current system of education in Kenya, learning numeracy and mathematics operations/computations is done in the first 3 years of primary school. During this period, the computation processes are established and learners are equipped with the basic computational skills pertinent to learning mathematics throughout primary and other levels of education. After class three, it is assumed that most learners can perform basic mathematics operations (Arasa, 2004; KIE, 2010). Therefore, if a learner failed to acquire the basic computational skills, will the learner have a basic foundation upon which to build subsequent skills? From class four to eight, the mathematics learned earlier is reinforced and expanded with addition of more complex concepts. Moreover, the 8-4-4 system is based on written materials in which children are expected to read, understand and work out sums themselves. The examinations, both theory and practical require learners to decode and comprehend so as to work out sums. Therefore, achieving basic computations skills plus mathematics operations is not only of critical importance for success in school but is also one of the primary ways of learning. Mathematics disability manifests as: Computational and conceptual (reasoning) problems (Arasa, 2004). This therefore, forms the bedrock upon which we anchor our prerequisite questions, what methods did the teachers use identifying pupils with MD? what are the common MD pupils experienced and how did the remedial teaching influence the mathematics performance of pupils with MD?.

2.3. Methods of Identifying Pupils with MD

The literature review indicates that there are different methods of identifying children with MD. These are discussed in the subsequent sections;

2.3.1 Differential Diagnosis

According to Chadha (2001) and Geartheart (1985) Mathematics Difficulties is hidden and may manifest like other commonly known disabilities such as visual, hearing and mental retardation Hence, the need to differentiate between a child with MD from the one with hearing, mental or visual impairments.

To begin with a child with MD can read both large and small print unlike the visually impaired who only reads large print. However, the child with MD reads with behaviors such as frequent reversals, omissions, insertions and substitutions. Children with MD can read but not willingly or frequently unlike a child with VI who may not read at all due to eye problems. A child with MD keeps the book at a normal range but a child with VI keeps the book too close or far, an MD moves constantly unlike the visually impaired who has problems with motion, a child with MD won't stumble on objects/people but a child with VI bumps into people or objects. Also a child with VI constantly asks others what is written on the chalkboard unlike the child with MD who sees normally.

In addition to that a child with HI has problems with listening and reads the speaker's lips to understand whereas a child with MD is only distracted and may easily look at a wrong stimulus for example the teacher's necklace and not color

of the pen he/she is displaying. Secondly, a child with HI will have limited language but a child with MD might or not have limited language. A child with MD will be hyperactive changing from one activity to another while a child with HI looks lost, not hyperactive and may not grasp ideas because of limitation in hearing.

Also, a child with MD might or might not have delayed milestones like an MR who has delayed milestones like sitting, walking and talking. A child with MD might not read but can understand the word form an explanation unlike a child with MR who can read but cannot explain the meaning. A child with MR will not understand abstract concepts and has a short attention span. A child with MD can easily understand abstract concepts and might or not have short attention span. Also a child with MD has average or above intelligence unlike the one with MR who has a sub-average intelligence. Furthermore, a child with learning disabilities might have a problem in one area such as reading, writing or arithmetic unlike a child with MR who has difficulty in comprehending all areas – academic and non – academic.

Finally, a typical child with MD might also have more problems in written than spoken languages unlike a mentally retarded child who exhibits problems both in spoken and written language. All children might not show all these symptoms, but if they show any four of these, then care should be taken to differentiate learning disability from visual, hearing impairments and mental retardation (Chadha,

2001).This study aimed at finding out if teachers had any training to use this method to identify pupils with MD.

2.3.2 Recognizing the Student's Strength and Clusters of Characteristics

The MDs have much strengths, for instance, some pupils with MD do well in computer applications and reading skills but have problems with mathematics. Some have strong social skills and acquire many pals, others do well in artistic and creative endeavors, and some excel at physical activities and sports. It is important to recognize the child's strengths, and to use those recognized strengths when designing their teaching plan (Gardner, 1999; Lavine, 2002, 2003). It is also helpful to look for clusters of characteristics when evaluating a child with MD. For example, a child with severe hand writing problems may also have difficulty with other fine-motor skills. A child with reading problems may also have underlying oral language disorder. A child who is poor in expression may have a history of delayed speech, speech-motor difficulties that affect articulation, and difficulty with remembering words. The study endeavored to ascertain which factors could impede teachers using this method in identifying MD.

2.3.3. Direct Observation

Careful observation of students in a class is very valuable. When walking around the classroom, a teacher can note a child performing mathematics and detect any trouble the child has. This can be used in any area of concern to paint an overall picture of child and suggest a beginning point for making remedial measures

(Chadha, 2001 & Learner, 2006).The researcher wanted to find out if teachers used this method in identifying MD plus possible factors that could hinder its effective use in successful identification of MD,

2.4 Forms of Mathematics Difficulties

There are different forms of difficulties that pupils with MD experience. For instance studies by Fuchs, Fuchs, & Prentice, (2002) and Hanich, Jordan , Kaplan & Dick, 2001) reveal that children who exhibit mathematics difficulties include those performing well below average range or children having difficulty in mathematical performance (Kosc, 1974). Some of the children experiencing Mathematics Difficulties may do well in language but not Mathematics and quantitative learning. They experience problems in Mathematical Calculations and mathematical reasoning (IDEA- 2004, Public Law 108 – 446). Mathematics Difficulties start in early years and continues through secondary school years if the child is denied a chance to count, match, sort and group objects, compare and understand one-on–one correspondence (Cass et-al, 2003; Miller and Mercer, 1997; Shalev et-al 1998). Mathematics Difficulties manifests as: Computational and conceptual (reasoning) problems.

A child having Mathematics Difficulties will experience these problems: - the child is unable to put together (add), put away (Subtract), divide and multiply (Grear heart, 1985). The child also fails to apply mathematical rules, does not finish problems, cannot read multi digit numbers, cannot differentiate between numbers such as 6,9,2,5, cannot differentiate between coins, cannot copy numbers

or symbols well, the child has problems with oral drills and doing word problems. The learner cannot write numbers from dictation nor write numbers legibly (Chadha, 1999, http.www.wpic. org).

The child is very slow and inaccurate, has problems telling time and has problems solving multi-step problems. The child is unable to correctly use arithmetic vocabulary, manifests a lot of careless computational mistakes, is disinterested and easily gives up in solving Math problems (Chadha, 2001; Lerner, 2006; Lyon, 1996 & Mercer, 1991).

The child having Mathematics Difficulties will manifest these intrinsic problems:- poor understanding of questions, poor shapes discrimination, poor quantity discrimination, poor spatial orientation, poor mastery of Mathematics concepts, unable to perceive distance between numbers on a ruler, unable to distinguish between; up – down, over – under, top – bottom, high –low. The child cannot also count objects in series without grasping them, cannot perceive shapes as complete entries and have poor number recognition (Blay Thornton, 2001; Lerner, 2006 & Vande Walle, 2004). Also, a child having MD has a poor sense of time and direction, easily gets lost and cannot find their way home from school, and has poor time estimation (Lerner, 2001). Poor in abstract thinking, sequencing items and establishing relationships such as big, small, more, less, poor in following procedure and responds quickly but wrongly in oral drills, rubs their work regularly and does not attend to details in solving problems and lacks interest

(Gear heart, 1985; Lyon, 1996 & Mercer, 1992). & Mercer,1992). Consequently, this study sought to establish the common forms of MD pupils identified experienced.

2.5 Remedial Teaching for Pupils with MD

Early Intervention involves the use of special teaching techniques to overcome difficulties in learning, such as difficulties in forming concepts or faulty learning habits with the aim of removing the effects of poor learning or lack of learning. This is because Children with MD just like any other students need to learn by acquiring and retaining knowledge for application in daily life. For effective learning, the learner must interact well with the material being learned, practice on it and receive feedback from an expert (Neil, 1997). Different learning intervention strategies, techniques, principles or rules are used to facilitate the acquisition, manipulation, integration, storage and retrieval of information across settings (Alley Deshler, 1979). This process of early intervention plays a significant role as portrayed by research studies. For instance a study conducted by Weinberg (1978) postulates that early intervention of MD acts as a safety valve for the children with MD resulting from poor performance causing social stigma that these children get from others and the society. This social stigmatization lowers the child's self esteem and makes their self concept negative, thus making their future educational outcomes poor (Jones, 1986). Early intervention will prevent or ameliorate the effect of the problems in the child's later academic years (Linder, 1983). The Remedial Teaching programme also helps to reduce the high drop-out rate of children from school due to consistency

in poor performance and frustrations as a result of the learning impairments (Chadha, 2001). This study therefore, intended to investigate if teachers conduct Remedial Teaching, Methods used, time during which it is done and its impact on the mathematics performance of learners with MD.

2.5.1. Remedial Teaching Programme

Remedial teaching is the application of special teaching techniques to overcome difficulties in learning, such as difficulties in forming concepts or faulty learning habits. The main function of remedial teaching is to remove the effects of poor learning or lack of learning. In the teaching of mathematics various methods have been suggested and have been used. Providing remedial education is another method used to improve the mathematics performance of learners with MD. While some countries are making great strides in achieving universal student attendance, learning levels are lagging behind. For example, the enrollment rate in Ghana is 95%; however, less than half of 3rd grade students have the minimum competency level in reading, writing, and basic arithmetic. In order to improve the learning levels of students, researchers at Innovations for Poverty Action have implemented remedial education in schools in Kenya and India. One intervention in India hired local young women, called balsakhis, who had completed at least secondary education to teach lower performing students basic math and language skills for two hours during the school day. The children in the remedial education program were 2nd, 3rd, and 4th grade students who had not yet displayed the math and reading competencies taught in 1st and 2nd Grade. Another program used volunteer teachers to provide this extra education outside of school. The

Kenya intervention hired contract workers to provide remedial education (Mburugu, 2011).

The remedial education provided in the first program resulted in improvements on all math and verbal tests in a highly cost-effective manner. For example, at the start of the second year of the program, only 5 to 6 % of the students could add two-digit numbers. At the end of the year, 51 % of the students who were taught by balsakhis had mathematics competency, compared to 39 % among those who were not taught by balsakhis. This intervention led to especially significant gains in competencies among marginalized and poorer students who are often the ones left behind. At Kambui High school teachers employed ability group method where students were grouped according to their mathematics ability. This approach was very successful.

It is important not only to increase student attendance so that all children have the opportunity to earn an education, but also to work toward the end goal of increasing student competencies, especially among those who stand to benefit the most from education. Pouring money into teachers and materials for schools is futile unless it is accompanied by measures to ensure that students are able to take full advantage of those resources. Hence this study endeavored to find out which Remedial teaching programmes are used and how it has impact on the performance of pupils with MD in mathematics.

There are different kinds of teaching programs that are presumed to mean remedial teaching programmes. For instance, a research study was conducted by Mburugu (2011) on the status of private tuition in public secondary schools in Mirigamieru West Division, Imenti North District. The purpose of the study was to establish the extent to which private tuition is done, forms of private tuition, students' and parents 'perception of the private tuition and subjects included in the tuition. The findings of study revealed that private tuition was done in most public schools. Teachers taught children in their schools and at times in other venues outside the school compound. The tuition was paid on hourly or session basis ranging from 1000-1500 and in some cases higher than that. The subjects mostly taught in tuition were those considered important like mathematics, language and sciences. The lesson duration was too long spanning for a period of 1-2 hours or at times more. The work done was just the normal syllabus and it is not designed for any special needs. The classes are usually overcrowded with as many as 50 students and more. The time for the tuition is usually over the weekends, after formal classes in the evening or during school holidays (Wanyama and Njeru, 2004). This study did not seem to address the problem of learners with MD but a mere coverage of work for better grades. Therefore, the researcher sought to find out what kind of remedial teaching was done and in what time it was done.

Information from the literature reviewed depicted that tuition takes different forms and the class size differs from country to country. According to Raffick

(2004) it can be done on one to one basis, home based, in small groups, in tuition centers and in large theatre halls. The private tuition is also conducted at school premises in Asia, America, Europe and Africa (Bray, 2003). Raffick argues that private tuition is necessitated by a heavy emphasis on exams forcing students to seek outside help. The pressure to excel in exams accentuates students and parents demand for tuition. All students are afraid of being overtaken by their peers. Despite prevalence, tuition is banned in Kenya. According to the assessment report Are Our Children Learning? Annual Assessment Report UWEZO Kenya (2010) claims that ceaseless learning and holiday tuition as children go up the academic ladder deprives them of the crucial play time valuable for their development. This means we are celebrating achievement at theory level for the few able pupils when results come out annually but leaving out a considerable number who experience MD without any remedial teaching leading to a higher wastage of many brains that would have otherwise done better if helped early. Hence the need for this.

Although private tuition is allowed to go on, no directives have been given on how remedial classes should be conducted. Teachers therefore; are left to conduct tuition and claim they are offering remedial teaching, making it difficult to distinguish between private tuition and remedial teaching for learners with SNE like those experiencing MD. Moreover, there is no common approach in the way private tuition or Remedial Teaching is conducted in different schools yet there is a dearth of information on the devastating consequences of private tuition on children's development and the entire education system (Wanyama & Njeru,

2004). This is because private tuition tends to focus on subjects that are deemed instrumental especially language, mathematics and the sciences.

In Kenya, most students still perform very poorly in these instrumental subjects that are regularly taught in tuition. Kibere (2005) because teachers did not even keep any professional documents during tuition. For instance, they lacked schemes of work; lesson plans or notes, records of work covered but only kept attendance registers and to some extent payment registers. The tuition lessons were conducted late in the evening when the students were too tired, the lessons took too long, denied children the play time, they were too teacher directed and only allowed learners to take notes. In 1994, the Mauritius government discouraged tutoring on all grades and prohibited especially the lower classes (Mauritius Government, 1994) although ambitious parents still defied the ban with dire consequences on their children. Therefore this endeavors to investigate the impact of the remedial teaching on the mathematics performance of pupils with MD.

Aguele Mathew (1996) did a study on effectiveness of selected strategies in the Remediation of process errors committed by senior secondary students in Mathematics in Nigeria. The study was to determine the effectiveness of selected teaching strategies in the remediation of process errors committed by students in mathematics in senior secondary schools. Results revealed that the direct instruction was a more effective strategy for the remediation of process errors

committed by students in mathematics. The study recommended that enough practice activities should be given to students during class sessions to assist them develop mastery of content taught. Aguele (1996) and Ifamuyiwa (1999) revealed that students' performance in the subject continues to decline and almost getting to a dangerous peak.

Other studies done by Osafehiti (1990); Buhari (1994); Brignull (1999); Aguele and Ifamuyiwa (1999); Harbor-Peters (2001) have offered numerous reasons for students 'poor performance in mathematics. Sometimes, the finger is pointed at the teachers suggesting that the subject is not properly taught. At other times the finger is pointed at the subject area, suggesting that mathematics is an unusual and difficult subject. Sometimes the finger is pointed at the students, suggesting they aren't working hard enough or taking the subject seriously. Other studies, Aguele (1996) and Usman and Harbor-Peters (1998), have also indicated that other factors are contributing to the poor performance level of students. Among these factors are the process errors committed by students while carrying out mathematical operations. According to Harbor-Peters and Ugwu (1995) teachers inability to diagnose these process errors among other factors have contributed, to a large extent, to students' poor performance in internal and external examinations. Therefore, if their poor performance must be improved upon, these errors should be identified and remedied. Similarly, this study sought to establish if teachers not only identified MD early but also had remedial teaching programmes plus its impact on the mathematics performance of pupils with MD.

Against this background therefore, this study investigated the effectiveness of DI and the Wilson's learning cycle (WLC) in the remediation of process errors committed by students in mathematics. The Direct Instruction (DI) or Basic Practice Strategy (BPS), one of the behavior strategies incorporates stimulus control, reinforcement and modeling. The teaching strategy involves a seven step lesson procedure. These steps according to Montague, Hoffman and Huntsberger (1993) are review of previous prerequisite learning, explicit statement of lesson objectives, presentation of new material, modeling of skill, guided practice, brief review of steps used in performing the skill and independent practice. For this study a re-teach was introduced to provide for remediation for student with difficulties. The learning cycle, on the other hand as a teaching approach involves students in an active learning process model on four elements of Jean Piaget's theory of cognitive development. These are physical experience social interaction, physical maturation and self regulation (Barman and Allard 1993). The Wilson's learning cycle, one of such learning cycle, consists of the following five steps: Initiating, Abstracting, Schematizing, Consolidating and Transfer Oduwale and Odiase (1996). Studies including Isineyi (1990), Ugwu and Harbor-Peters (1995), Usman and Harbor-Peters (1998) observed that the variables of sex and location of school influences the rate of commitment of process errors by students. This study therefore attempted to resolve the following questions :(i) Are the Direct Instruction (DI) and Wilson Learning Cycle (WLC) effective in the remediation of process errors? (ii) Does the sex of the students affect the effectiveness of the DI and WLC? (iii)Does the location of the school of the students influence the

effectiveness of the DI and WLC? The resolution of the above questions constitutes the problem of this study.

The study employed the quasi-experimental design. Intact classes of students were used. Results of data analysis showed that the main effects were seen to be significant at $p<0.05$ for the teaching strategies and not significant for gender and school location. This indicated that there was no significant interaction of the effects of teaching strategies, sex and school location on the remediation of process errors committed by students in mathematics.

Concerning the effectiveness of the direct instruction (DI) and the Wilson's learning cycle (WLC) in the remediation of process errors committed by senior secondary school students in mathematics. The study also sought to find out whether school location and gender had any influence on the effectiveness of the teaching strategies. Direct instruction was a more effective teaching strategy in the remediation of process errors committed by students. Direct instruction provides enough opportunity for learners to practice skills learnt. This results in the mastery of such skills thus allowing for the remediation of more process errors committed by students. This agrees with the findings of Din (1998) that direct instruction used effectively could help students to remedy their basic mathematical skills.

In the error by error analysis results indicated that the proportion of conceptual errors remedied by DI was 0.923 while that remedied by WLC was 0.727, showing a proportion difference of 0.196 in favor of DI. This proportion difference was found significant at the 0.05 level of significance for a z-test of two population proportions. This implies that the DI was a more effective strategy for the remediation of conceptual errors committed by students in mathematics. In the case of translation error, the study showed proportion difference of 0.114 in favor of DI. This difference however, was found not significant when tested at $p<0.05$ using a z-test for two population proportions. This implied that no one strategy appeared to have been more effective than the other in the remediation of translation errors committed by students in mathematics.

For the applied errors a proportion difference of 0.220 in favor of DI was found. This difference was significant at the 0.05 level of significance for a z-test of two population proportions. The implication of this was that the DI appeared to have been a more effective strategy in the remediation of applied errors. Concerning logical errors, the difference between the proportion of errors remedied by the DI and WLC was found significant at $p<0.05$ using a z-test of two population proportions. This implies that the DI was a more effective teaching strategy than the WLC in the remediation of logical errors committed by students in mathematics. The observed effectiveness of the DI over the WLC and lecture method in the remediation of the different categories of process errors may have been due to the guided practice provided for by DI. This situation allowed the

teacher to direct, offer necessary guidance and supervises students' activities during practice.

According to Aguele (2004), the supervision of students' activities has large impact on their overall acquisition and improvement of basic skills. The DI also has provision for independent practice during which students were given opportunity to practice with a variety of problems that could lead to mastery of the skill being taught. This is in agreement with Otto and Mcmenemy (1983) that in remediation, success is reinforced through variety of activities, pupils' involvement and repetitive practice that is necessary for mastery. This is also in agreement with Payne and Squibb (1990) that the probability of choosing a correct rule to solve a given problem is deter-mined by the frequency of use in the past.

This underscores the need for repetitive practice in any content that the students are taught in the classroom. Results of data analysis also revealed that neither the sex of the students nor the location of their school had any influence on the effectiveness of the DI or WLC. Results of data analysis further revealed that there was no significant interaction effect of teaching strategy, gender and school location on the remediation of aggregate process errors committed by students. This implied that the effectiveness of DI and WLC on the remediation of process errors committed by students in mathematics were not sensitive to the sex of students and the location of schools (urban or rural).

In other words, so long as the teaching strategies provide equal opportunities for the students, regardless of their sex or the location of their school, students' performances are likely to be the same. This agrees with Akinyemi (cited in Onwuegbu 1998). Kpangban and Onwuegbu (1995) and Onwuegbu (1998) discuss some of the factors that influence the effectiveness of teaching strategies in the class-room. In their discussion sex and location of school were never factors of consideration. Factors enumerated by them were the teacher, the students' likes and dislikes, interests and values. To this extent, the finding that there was no significant interaction effect of teaching strategy, sex and school location may therefore be in order.

Based on the findings of the study, the following conclusions were made. Firstly, it was observed that direct instruction and Wilson's learning cycle were both effective in the remediation of process errors committed by students in mathematics. However, the direct instruction appears to have been more effective than the Wilson's learning cycle. Secondly direct instruction appears to have been more effective than the Wilson's learning cycle in the remediation of the different categories of process errors. These process errors were conceptual, translation and applied errors. The study further revealed that no sex appeared to have benefited more than the other from any of the teaching strategies (direct instruction, Wilson's learning cycle and the control) in the remediation of process errors committed by students in mathematics. Lastly the location of school, whether urban or rural, does not seem to have any influence on the effectiveness of any of

the teaching strategies employed in the study. This is an indication that if both strategies are used effectively in urban and rural arrears they are likely to produce the same results. This study equally sought to establish the impact of the Remedial Teaching on the control group and how school type and gender performance of children with MD in mathematics.

Concerning the effective teaching strategy, research studies by in the U.S (Englert, 1984; Nowacele, McKinney, 1990; Rosenshine & Stevens, 1986; Sindelar, 1990) have established that systematic provision of instructions to students greatly improves their achievement. Using this systematic approach in teaching furthers educational opportunities for all students especially those with mathematics difficulties. According to Rosenshine and Stevens (1986), effective teachers teach in small steps, practice, each step, guide students during initial practice and provide children with opportunities for success. Further still, studies by (Englert, 1984) revealed that successful teachers provided students with opportunities for both direct instruction and practice. Other studies by (Sindelar, Espina, Smith & Harriman , 1990) asserts that the more time an actively engaged educator spends in instructional process, the more positive students' behavior will become plus enhanced achievement (Sindelar, 1990).

Effective teaching limits seatwork activities and provides students with more opportunities to learn through questioning. It also allows time for teachers to socially interact with students. Encouraging high levels of student participation,

providing effective classroom traditions (i.e. concluding one activity and moving on to another) and ending lessons by providing assignment for further practice are consistent with teacher-directed teaching. According to Nowacele (1990) teacher-directed rather than student-directed, activities provide an effective educational experience that most likely improves student achievement. Higher levels of student achievements occur when teachers use systematic approach, get more organized, set clear expectations, maintain student attention, and provide immediate, corrective and constructive feedback. They also provide positive environments in which to learn. This reveals a gap for study: Are our teachers well equipped with the necessary skills to identify specific mathematical difficulties, what intervention strategies are they using and how effective are these strategies?

The other ideal ways of intervention involves designing an Individualised Education Programme based on the learner's specific needs which according to IDEA (2004) and PL-108-446) creates an opportunity for teachers, parents, school administration, related services personnel and students (when appropriate) to work together and improve the educational results for children with mathematics difficulties. This is realized by prescribing specific educational goals and activities for individual student. It is also a management tool for the entire assessment teaching process that also forms a critical link between the learner with mathematics difficulties and the specialized teaching the student needs.

According to studies done by Bateman & Linder (1998) in the U.S, the IEP ensures that the education designed for an individual student is appropriate for the student's learning needs and that the special education services are delivered and monitored. It represents an entire accountability system in miniature outlines the learner expectations, assessment strategies, and performance standards. The strategy involves identifying/ assessing the students and thereafter giving the learners instructions designed to help them learn like their peers without the difficulty. Finally, the learner's achievement is reviewed to establish progress made in line with the IEP. The IEP has report cards that should be sent to the parents regularly to update them on the child's progress (IDEA 2004). This study endeavored to find out if teachers had specific remedial teaching programmes and how they administered them for effective intervention of MD.

The other effective remedial teaching strategy in the Multi sensory Approach which according to Maccini & Gagnon (2000) offers children with MD extra assistance through hands on manipulative and pictorial representations of mathematical concepts. Hands on experiences allow children to understand numerical and abstract equations at a concrete level, making the information more accessible to all learners. Chadha (2001), stipulates that children with mathematics difficulties learn best when the content is presented in more than one modality. This involves the use of body movement, touch, stimulation along with visual, auditory and olfactory make learning more effective for the child. In this approach therefore, the child sees, feels, hears and touches the content. Embossed letters, visual aids, block puzzles and other learning materials are used. This

enhances participation, acquisition, storage and future retrieval of the acquired facts.

Hence, there is improved performance and better educational outcomes. Pragmatic learning through themes is encouraged in Kenyan pre-schools (Ouko, 2007) the repeated use of same theme content enhances retention while Mwangi (2007) states that effective use of learning materials enhance children's performance in mathematics activities.

Finally, a research study was done in the U.S by Carnine &Stein (1981) on peer tutoring for children with learning disabilities to investigate effects of peer tutoring on the acquisition of addition facts in primary –aged learners with mathematics difficulties and the relative effectiveness of two peer tutoring procedures: counting on and rote memorization methods. Results strongly supported the use of peer tutoring. Peer tutoring has been proposed as a means of providing time and cost effective individualized instructions for children with mathematics difficulties (Cooke, Heron & Heward, 1983; Jenkins& Jenkins, 1981, 1988). The rationale for peer tutoring is constructed on the premise that the amount of time spent actively engaged in academic responding is related to the content covered and to student achievement gains (Rosenshine (1986). Empirical investigation of peer tutoring with learners of mathematics difficulties have established that the amount and type of tutor training is important to the outcomes in training programmes. Learners taught by teachers trained in task procedures

and delivery of reinforcement performs better than those taught by untrained teachers (McGee, Kauffman & Nussen, 1977). Further, effects of peer tutoring are maximized when the program emphasizes repetition and incorporates review (Cooke et al, 1983)

Also, studies done in the U.S by Preston (1993), reveal that when a child with mathematics difficulties is paired with others who are more competent in the task being undertaken, their competence is raised. The More Knowledgeable Other (MKO) will raise the level of competence in the weaker child till they can accomplish a task that they would not have performed on their own (Vigotsky, 1962: Chad, 2007). The child with mathematics difficulties will emulate what the more capable student is doing and thus raising their level of performance (Deborah (2001). This literature therefore begs for answers to these questions; do our teachers use group dynamics in intervention of mathematics difficulties, how equipped are they to effectively organize successful peer tutoring?

2.6 Effect of Remedial Teaching on Pupils Performance

Studies by Lyon (2001) reveal that Remedial Teaching reduce the number of children experiencing learning difficulties by 70 percent and consequently enable children who having mathematics difficulties to maximize their potentials in life just like their 'normal children' (Lerner 2006). Parents of learners with mathematics difficulties to align them to existing intervention programmes which in turn rehabilitate them academically (Linder, 1983). Remedial Teaching also reduce school failure greatly (Lerner, 2002) by accelerating cognitive and social

development and reducing behavior problems resulting from the disability. According to Woolery (2003) many difficult conditions are alleviated, disorders are overcome and other problems managed to control the occurrence of secondary problems for better educational outcomes of the child in future. (Lerner, 2006)

Further research by Gophick, Meltzoff & Kuhl (1999) and Keogh (2000) states that children who are at risk of mathematics difficulties dramatically improve when given Remedial Teaching. The influence of early intervention has a lasting impact on the learner's brain development. West (2003) indicates that 30 – 40% of 300 individuals who have achieved a high level of financial success in USA had learning difficulties at some point in their life but received early intervention. A major business magazine: Fortune (Morris, 2002) enumerated many CEO's of major corporations who had LD but received early intervention which resulted to good educational outcomes. Children with LD may be gifted and talented (Fletcher et al, 2004) hence need for quick early intervention programmes. According to Weinberg (1978) Remedial Teaching for children with MD acts as a safety valve from the social stigma that these children with disabilities get from others and the society as a especially when they are not performing well academically. This social stigmatization lowers the child's self esteem and makes their self concept negative, thus making their future educational outcomes poor (Jones, 1986). Consequently, Remedial Teaching will prevent or ameliorate the effect of the problems in the child's later academic years (Linder, 1983). The programme will also reduce the high drop-out rate of children from school due to

consistency poor performance and frustrations as a result of the learning impairments (Chadha, 2001). The preliminary evidence of the Every Child Counts Research Phase suggests that for children who have significant MDs individualized intervention is better, both because it can be more precisely targeted and because such children have often developed educationally maladaptive strategies to cope in group situations, i.e. strategies of hiding their difficulties, which may make them harder to diagnose and overcome.

Small-group teaching may, however, provide useful opportunities for discussion and reflection about strategies, and for 'peer tuition'; and it may be beneficial for children with very mild difficulties and/or as a supplement or follow-up treatment for children who also undergo individualized intervention. This area will be the focus of a robust external evaluation as part of the development of Numbers Count. Appropriate use, development and testing of apparatus and multisensory and multi-context teaching.

There is evidence that use of structured apparatus and multisensory teaching can be helpful and effective in interventions, especially with children who have failed to acquire useful representations of number. Learning tends to be more effective if it occurs in several different contexts and children are encouraged to relate them to each other. Otherwise, children may learn very efficiently in one context but not apply it to others. At one time, it was thought that if children are initially encouraged to use concrete objects to solve arithmetic problems, they will later be able to transfer their learning to other, more abstract problems. As a child

informed Hart (1989), ‘Bricks is bricks and a sum is a sum’. Moreover, children may not always understand the concrete materials themselves, or how these are related to number (Dowker, 2005; Hannell, 2005). Hannell (2005, p. 28) quotes an adult reminiscing about his school experiences: I never did really get what those little wooden blocks were all about. I said they were ‘tens’ and ‘ones’ because that was what the teacher said we had to call them; but it never, ever dawned on me that they could stand for anything real like ten kids, or ten dollars. They were just little bits of wood that we did things with. Hence, it is important to present materials in a variety of contexts and a variety of sensory modalities, and encourage children to make links (Fuson, 1992). The use of a multisensory approach, and of materials that lend themselves well to such an approach, are currently recommended by numerous educators (Haseler, 2008; Henderson, Carne and Brough, 2003; Thomas and Allingham, 2008) and advocated in the Williams Review (Williams, 2008). At the same time, it is pointed out that simply giving children the materials may not be sufficient, It is also important to remember that however ‘good’ we believe the equipment to be, it will only be of value to pupils if it is used by suitably trained staff who understand the rationale behind it. It is important to investigate the best methods of using such equipment, and also the extent to which it may be more suited to some children than others (Dowker, 2005). It is also important to investigate whether there is any difference in effectiveness between different types of multisensory apparatus. However, there other important factors that can influence the success of remedial teaching for pupils with MD.

To begin with, the influence of family Type and Size on children's academic performance, a study was conducted in Nigeria by Tenibiaje Dele (2009) to find out the influence of family type and size on academic performance of adolescents in higher institutions. The findings of the study revealed that the type of family the child comes from (either monogamous or polygamous) usually has an impact on the child's academic performance. It is important to note that either the type of family (monogamous or polygamous) dictates the size of the family. In Nigeria the data collected indicated that polygamous families are common among well educated as well among poorly educated families and equally common among professional and managerial fathers of the top occupational hierarchy. Workers at the bottom hierarchy were prominent in the practice of polygamy.

Information from the literature reviewed depicted that children from larger families are found to do worse than children from small families. Smilarly according to Powell and Steelman (1993) and Van Ejick and Degraaf (1995) children's academic performance depends on the inputs of time and money from their parents. The more children the family has, the less of all important resources the family invests not only in terms of money but also in terms of such inputs as time, attention resource distribution and so forth. Studies by Kee (2006) indicated that children from larger families have lower levels of education due to issues pertaining to resource allocation. Hence the need to find out how the parents occupation and family size relate with the child's academic performance.

The other factor influencing the effect of remedial teaching is the child's ordinal position. Studies conducted in the past on the relationships between birth order and academic achievement indicates positive relationships. For example Abiam (2006) revealed that the relationship between the birth order and first born and configurations of oldest and only children as being children are significantly more creative on verbal tests of creativity than later borns. Nwafor and Ango (1988) observed that there was outstanding performance between first borns and later borns. Spears (1982) in his study investigated that birth order effect on first borns with later borns, revealed that later children were less capable than earlier siblings when birth order and family size were controlled, family size had a negative relationship to intelligence. Similarly, children from lower birth order did more badly than those higher up the birth order (Tenibiaje, 2009).

According to Adler as cited in Uba (1989), first birth or oldest child is usually advantaged by good deal and warmth during the early years of life, which he enjoys all alone. Observations and studies indicate that more attention and time is accorded the first borns (Becker, 1981). Parental attention declines as the number of children increases and later born children perform less well than older siblings. Also, studies by Abodium (1997) showed that as students grew in age, their academic performance diminished. There is a negative relationship between age and school achievement (Garrison, 2004). Consequently, the researcher wanted to know the ordinal position of pupils identified with MD to see the correlation with performance.

Does the children's gender have a bearing on the effectiveness of the remedial teaching? Over the last decade, Kenya has made significant progress in education, achieving gender parity in primary education enrollment and near parity at secondary level. However, as the above data show, gender parity does not mean that universal access to primary education has been achieved and enrolment in secondary education remains low for both boys (51%) and girls (48%). This is of a particular concern for girls, as the data imply, over half of secondary school age girls are not enrolled in secondary education.

Women's literacy rate has significantly increased as a result of positive government policies and strategies. However, despite progress in education as a whole, gender disparity remains a challenge as 16% of women in Kenya still lack basic literacy skills, compared with 9% of men. The failure to promote and retain girls in secondary education is probably one factor negatively affecting the slow progress in women's literacy. UNESCO Global Partnership for Girls' and Women's Education

One of the main reasons for the low enrollment of girls in secondary education is the persistent high level of poverty, especially in urban slums and rural areas. Most families are unable to cover the cost of their children's education and opportunity costs for sending children to school are high. Furthermore, as socio-cultural norms based on patriarchy prevail, families tend to give priority to boys' education when faced with financial constraints. In addition, factors such as lack

of adequate infrastructure, inadequate guidelines for policy implementation, as well as prevalence of HIV and AIDS, have prevented girls from accessing education. Along with the need to rapidly expand the provision of secondary education, the quality of education at this level and below needs to be addressed.

This could best explain why over years, analysis of performance by gender has indicated that boys have had a better performance in mathematics than girls. Statistics from the MOEST (2002) as reviewed by Miheso (2002) in a study on Factors affecting mathematics performance among secondary students in Nairobi province indicated a mean grade for girls for the year 2000 and 2001 at 13.45% and 15.8% respectively while boys scored 18.67% and 21.20% respectively. The same study in Nairobi further revealed that girls scored 63.7% of the quality grades recorded (A, A- and B+) compared to the boys' score of 36.3%. Also, only 43.4% 0f girls scored grade E whereas 56.6% of the boys scored grade Es. The researcher sought to find out if gender influenced the mathematics performance of pupils with MD.

In the **s**tudy was done by Runo (2010) on the identification of reading and teacher oriented challenges in teaching reading to class 5 learners in Nyeri and Nairobi districts with the aim of t finding out whether teachers were able to identify reading difficulties, methods used in teaching these learners and any interventional measures in place. The findings were that teachers identified non readers. There were more non reader boys (103) compared to the girls' (78). This

study therefore, sought to answer these vital questions; Do the teachers have the pedagogical skills necessary to identify learners with mathematics difficulties, and in what way is the gender influencing mathematics performance of learners with mathematics difficulties?

Another study by Onduso (2010) titled A "Comparison of Teachers and Students attributions Regarding maths achievement'': A case study of Senoir Chief Koinange High school, Kiambu Disrtict. The findigs were that girls had a lower expectation in mathematics than boys. The study further revealed that female students reported less confidence in mathematics abilities than boys (Cohen & Kohler, 1991, Hasnson, 1992). Other studies indicate that mathematics is strongly stereotyped as masculine (Eccles, 1987, Hyder, Fennema & Lamon, 1990). Males and females differed in attributions for success and failures in mathematics (Leder, 1984 & Subotnik, 1988)

Finally, significant studies have shown that parents' socio economic status is a major predictor of the students' academic achievement (Coolican et al, 1996, Bryk & Smith, 1993). Parents' educational level and employment status is considered vital aspects of their socio economic status (SES) and affects children's education in the foundational years (Sinnes, 2005). The family plays a fundamental role in the child's academic performance and score.

Mothers' level of education and employment status also influence adolescents' educational outcome expectancy beliefs (Rhea & Otto, 2001). Students who

reported higher parental education levels tended to have higher average scores. Parents' educational status and employment acted as a SES indicator reflecting their potential for socio economic resources such as household incomes that are available to the student. Parents 'income and education have a high correlation in the US (Hauser & Warren, 1997). When income is examined as separate valuable, the research shows a consistent positive relationship between family income and student academic achievement. Hill and O'Neil (1994) found out that increasing family income by 10,000 dollars per year is associated with an increase in a student's achievement of 2-4 percentile points. Further research studies by Alvin and Thornton (1983) reveals that the education level of both the mum and dad affect the child's academic performance. In the studies done by OECD (2007) the mother's level of education was found to be the most critical variable. All in all, the family SES is the most fundamental variable than others (Fan, 2001). Students from low SES background were at a higher risk in view of their mathematics performance (Coleman et al, 1969). Consequently, this study sought to find out parents occupation and education level which are important factors in effective remedial teaching for pupils with MD.

2.7 Summary of the Literature Reviewed

Mathematics Difficulties is a condition in which children manifest inadequate development of mathematics skills and competencies leading to unexpected underachievement even when there was adequate opportunity to learn. There is therefore, a significant discrepancy between what the children have the potential

to do and what they are doing. MD is found in all civilizations across the world with far reaching consequences if not given early intervention.

From the literature reviewed, it was established that teachers in the US, India, Asia and other European nations identified children with MD. In Kenya, studies revealed that teachers only identified children with general Learning Difficulties either in language or mathematics but not specifically MD. Hence this study sought to establish if teachers identified children with MD and the common forms of MD most learners experienced.

Similarly in those nations, there was remedial teaching for children identified with MD with countries like US having special programmes designed for these learners with MD. In Kenya, language difficulties had received much attention in intervention than mathematics difficulties; hence the need to ascertain if there was remedial teaching for children with MD.

In countries like Mauritius, remedial teaching was usually done as general paid tuition in the afternoons when children were tired and under overcrowded conditions, this had lowered the impact of the remedial teaching programme on children's academic performance. Therefore, this study sought to establish the kind of remedial teaching programmes used in Butere, the time and mode of administration plus its impact on the mathematics performance of learners with MD.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the research design, the study location, target population, population sampling and sampling procedures. The chapter also deals with research instruments, pilot study, data collection, data analysis and presentation. It also highlights ethical considerations.

3.2 Research Design

This study employed the descriptive survey and a pre and post -test with a quasi-experimental design. Descriptive survey describes the nature of existing conditions and determines the relationship existing between the dependent and independent variables (Borg & Gall, 1989). In this study, descriptive survey gathered demographic information from pupils with MD such as age, ordinal position, family size and parents' employment status to measure their SES. Teachers' background information was also gathered. These included; number of pupils per class, number of boys and girls with MD common forms of MD, availability and impact of the remedial teaching on the mathematics performance of pupils with MD to alleviate poor performance in academic work. The results were analyzed by frequency tables, means scores and standard Deviations.

The pretest and posttest design with a quasi-experiment was also used. According to Shadish (2002), Stouffer (1950) and Campbell (1957) a quasi-

experimental design involves empirical study that estimates causal impact of an intervention on its target population. The design does not use randomization but allows the researcher to control treatment using other criteria for instance the use of cut off mark in the in the screening tests. This method is ideal where it is not feasible to conduct a true experiment. Being a natural experiment, the study findings may be applied to other subjects and settings, allowing generalizations about the population. It is also effective because the use of pre- post testing is ideal for educational intervention. Hence it is easier to apply in another regular school. The findings of the study may be applied to other subjects and settings allowing generalizations to be made about the population (De Vaus, 2008).

In this study, forty children with MD (from two public and private schools in Butere East and west respectively) were taken through a remedial teaching program as the experimental group (Group 1). The control group (Group II) consisted of forty other age matched children with MD studying in other selected public and private schools from Butere East and West respectively. At the beginning of the term a (pretest) designed to diagnose (the pre operational and operational errors in mathematics) was administered to both the experimental and control groups. Concerning test administration of the pretest, the researcher in collaboration with the teachers requested the children write their names on the paper before starting the test. The children were made to relax as they did the pretest. The test was designed to gather information about specific kinds of MD. The tool measured concepts in two areas; pre operational and operational skills.

The pre operational skills measured were; number identification, writing numbers in words, place value and dictation of words to numbers. The operational skills measured were; putting together, taking away, division, multiplication and fractions. After marking, all the last ten pupils in the pretest (screening test) were considered eligible for MD.

A written consent was obtained from the parents before including the children in the study. Twenty four lessons of thirty minutes each were conducted in a span of eight weeks to the experimental group. The remedial teaching program used was the SRTM (Samveda Research Training Model) which was domesticated in line with Kenyan syllabus and with some input of experienced class three mathematics teachers.

The lessons were conducted on Monday, Tuesday and Thursday afternoons during the usual normal tuition hours. The clubs activities were held on Wednesday and cleaning on Fridays. The rest of the children in the control group were not taught according to the remedial teaching program but attended the usual paid tuition that involved normal coverage of the syllabus. At the end of the term, a post test exam was administered to both the experimental and control groups.

3.3 Variables

The independent and dependent variables of this study are described in the subsequent sections;

3.3.1 Dependent Variable

The dependent variable of this study was performance in mathematics of pupils with mathematics difficulties. It was measured by comparing percentage average scores of pupils in the pre and post-tests.

3.3.2 Independent Variables

The independent variables of this study were; remedial teaching programme, type of school, and pupils' gender.

(i) Effect of remedial teaching was measured using percentage scores of pupils in the pre-test and post-tests. The skills measured were: Pre-operation skills; biggest no; smallest; missing numbers, place value and writing numbers in words and figures. Basic operation skills; putting together, taking away, addition and subtraction, multiplication, division and fractions.

(ii) Type of school was measured by determining the category of the school as being either public or private. The influence was measured by comparing the mean score of public and private in both the pre and post tests.

(iii) Gender was measured by stating whether the pupils with MD were boys or girls. The influence was measured by comparing the mean score of girls and boys in both the pre and posttests

3.4 Location of the Study

The study was done in Butere district. The district is found in Kakamega County in the Western region of Kenya. Butere district is bordered by Mumias to the North, Kakamega Central to the South, Bungoma to the West and Siaya to the East. Administratively, the district is made up of two educational divisions namely; Butere west and Butere east. This district lies along the equator and experiences high temperatures with two rain seasons. The main economic activities are sugarcane farming and to some extent maize farming. The district is served by a railway line and road network.

The study was conducted in Butere district because an earlier study done in the area by Uwezo Kenya (2010) revealed that a number of children in class seven or eight in Butere district could not compute standard two sums. This could be attributed to poor foundational setting in mathematics in lower primary school leading to poor performance in upper primary. Another study by Wafula (2009) revealed that about 24% of learners in the regular primary schools experienced learning difficulties especially in mathematics. Hence the need to give remedial teaching to pupils identified with MD and establish its influence on mathematics performance of pupils with MD. Recent results in national exams established that there was still poor performance. For instance, in the 2013 KCPE exams, only 46% scored above average. This poor performance could easily be alleviated if MD was not only identified but also remediated in class three. During this period, important mathematics concepts are supposed to be taught, failure to which children experience MD. Similarly, research studies indicate that successful

intervention of MD occurs during this period. It is on the basis of the foregoing that class three pupils in Butere District was selected for this study.

3.5 Target Population

The population of this study comprised of all class three pupils with MD and class three teachers in the 75 regular public and 7 private primary schools in Butere district. The study also targeted standard three teachers and pupils having mathematical difficulties from both public and private primary schools. Class three was targeted because it is during this level that important foundational skills in mathematics are laid down. Failure to lay this foundation results to poor performance in mathematics. On the other hand, effective intervention of MD also occurs during this period. The study targeted regular primary schools because of the need to promote inclusive education.

Table 3.1: Distribution of Schools in Butere District

Division	Private	Public
Butere west	05	39
Butere East	02	36
Total	07	75

Source: MOE (2011). Butere District statistics returns.

3.6 Sampling Techniques and Sample Size

The sampling techniques and sample size used in this study are described in the following subsection;

3.6.1 Sampling Techniques

Multiple sampling techniques were used in the study to sample the study area and the sample population. Kakamega County and Butere District were purposively sampled because they had the relevant information the researcher needed owing to the previous studies done in the areas on Mathematics Difficulties. Private schools and pupils with MD were equally sampled purposively. Stratified sampling method was used to select schools basing on ownership as private or public, zones and pupils according to gender. Proportionate systematic sampling was used to select four (4) schools from the two zones at the nth interval of (13). Proportionate sampling ensured that there was uniform representation of all schools from every stratum/zone to cater for the detailed nature of experimental design.

3.6.2 Sample Size

Ten last pupils in the screening test were selected from all the eight schools forming a pupils' population sample of eighty (80) pupils. (Forty formed the experimental and forty the control group). Eight (8) class three teachers were sampled to assist in administering the screening tool and remedial teaching programme. In schools with more than one stream, the most experienced

mathematics teacher was considered for the study. This meant that a total population of eighty eight (88) respondents formed the sample size.

3.7 Research Instruments

The data was collected using methodological triangulation method. This method refers to the use of multiple tools to gather data for the research problem. It involves analysis and comparison of the consistency of the data collected by the different methods. Methodological triangulation was also used to enhance the reliability and validity of the research findings.

3.7.1 Questionnaire

The questionnaires were used to obtain information on how teachers were identifying specific kinds of mathematics difficulties, remedial programmes available, how effective the remedial programme had been plus selective factors influencing intervention of mathematics difficulties. The questionnaire was divided into three sections; Section A: consisted of the teachers' background/demographic information analyzed using frequencies and mean scores. Section B: Had open ended questions that sought to establish if there was early identification for learners with mathematics difficulties and methods used in early identification of mathematics difficulties. It was analyzed by frequencies and mean scores as well. Section C had open ended questions that also sought to establish if there was remedial teaching for children with mathematics difficulties

and the remedial programmes used. Scoring for section section C employed quantitative methods that utilized frequencies and averages.

3.7.2 Screening Tool for Children with Mathematics Difficulties

This tool was adopted from the Samveda Research Training Centre tool for Learning Disabilities in India (Karisappa, 2008). The tool is posted on the web for use by any interested parties. However, the researcher domesticated it to suit the local educational set up in Kenya. The test is designed to gather information about specific kinds of mathematics difficulties and appropriate remedial teaching programme for early intervention. This tool comprised of three sections. Section A; measures of the pupils' demographic information using open ended questions and analyzed by frequencies. Section B; measures children's learning difficulties in pre operational skills measured by percentage scores in the pre and post tests. It had 61 items. Section C; considers children's learning difficulties in basic mathematics operations and is measured by percentage scores in the pre and post tests. This section had 39 items. All in all, the total score for the tool is 100 items.

3.8 Pilot Study

The instruments were pre-tested with two class three teachers and twenty pupils who were in the last ten positions in a private and public primary school within the district of study. The purpose of piloting was to test the appropriateness of the items to the learners and teachers with the aim of improving them so as to enhance the validity and reliability of the items. In addition to that piloting enhanced the memorization of the tool.

3.8.1 Validity

Content validity was used to test the validity of the instrument. Content validity refers to whether an instrument measures what it was intended to measure accurately or the degree to which a test measures a concept it is designed to measure accurately (Coolican, 1996; Orodho, 2004 and Best, 1992). It was ensured by following the syllabus, ensuring that all the items on the research instrument and all objectives and variables of the study were covered. Also, experienced class three teachers' input was sought to assess the relevance of the content used in the instruments.

3.8.2 Reliability

Best (1992) and Coolican (1996) state that reliability is a measure of the degree to which an instrument gives similar results over a number of repeated trials or a measure of consistency by an instrument in producing similar results on different but comparable occasions. To determine the reliability of both questionnaires and screening tool was administered through the test re test method at two different times to the same participants at a sufficient time interval. Scores for the two tests was computed by the Pearson Product Moment Correlation. A score of 0.7 and above meant the instruments were reliable. For internal consistency of the research tools, ambiguous questions were refined after the pilot study. The scores were correlated using Pearson Product Moment Correlation coefficient as indicated by Table 3.2 below;

Table 3.2: Test Retest Reliability

Correlations	**Correlations**	**Correlations**
Questionnaire	Test 1	Test 2
Pearson Correlation	.0836	.90
Sig (2 tailed)		
Correlations	**Correlations**	**Correlations**
Screening Tool	Test 1	Test 2
Pearson Correlation	.0864	.930
Sig (2 tailed)		

In this study, the reliability of the instruments was tested during piloting stage. Test re-test method was used to test the reliability of the instruments where two teachers from a public and private primary school were given the questionnaire on to fill and screening tool to try out on their pupils but were not included in the sample. The tools were again given to the same teachers after two weeks. The composite scores were computed for each teacher for the two sets. The scores were correlated using Pearson Product Moment Correlation coefficient. Findings indicated the existence of a strong positive correlation between the two sets of scores. The questionnaire had a correlation of 0.84 and 0.90 while that of the screening tool was 0.86 and 0.93 as shown in Table 3.2 above. Therefore, the instruments were found to be reliable.

3.9 Data Collection Procedures

The researcher was issued with a letter from the Graduate School Kenyatta University permitting him to collect data. This facilitated the researcher to obtain

a research permit from the Ministry of Education (District Education Office Butere) to conduct the study. An appointment with the head teachers of the sampled public and private primary schools was sought to brief them on the research to be conducted in their schools. Once the head teachers gave their consent, the class three teachers were contacted by the head teachers and briefed about the intended study and were asked to cooperate with the researcher. The parents' authority was sought by the researcher through the class three teachers. The research study was done in three stages as shown in the subsequent sections;

First Phase (screening for MD): At the beginning of the term (the first week on Friday the 14/9/12) a pretest designed to diagnose (the pre operational and operational errors in mathematics) was administered to all children in the eight (8) sampled schools. Concerning test administration of the pretest, the researcher in collaboration with the teachers requested the children to write their names on the paper before starting the test. The children were made to relax as they did the pretest. The tool measured concepts in two areas; pre operational and operational skills. The pre operational skills measured were; number identification, writing numbers in words, place value and dictation of words to numbers. The operational skills measured were; putting together, taking away, division, multiplication and fractions. This phase also established common errors committed by pupils when doing mathematics to help in the designing an Individualized Education Program (IED. All the last ten pupils in the pretest (screening test) were considered eligible for MD and hence ideal participants in

the study. A written consent was obtained from the parents before including the children in the study. (See a copy in the appendix iv).

Second Phase (Remedial Teaching): The researcher grouped the last eighty (80) learners in the pretest into the control (40 pupils) and experimental groups (40 pupils). A remedial teaching program of twenty four lessons (of thirty minutes each) was conducted in a span of eight weeks to the experimental group (from 17/9/2012 to 29/9/2012) while the control group attended the usual paid tuition done during the same hour. The remedial teaching program used was the SRTM (Samveda Research Training Model) which was domesticated in line with Kenyan syllabus and with some input from experienced class three mathematics teachers. The lessons were conducted on Monday, Tuesday and Thursday afternoons during the usual normal tuition hours because club activities and cleaning was done on Wednesday and Friday respectively.

The first phase the remedial teaching involved establishing errors committed by children when doing mathematics so as to help in formulating an Individualized Educational Program (IEP) for them. This program was aimed at helping children develop conceptual understanding of logical and sequential steps when doing mathematics operations. The learning experiences were highly concretized and participatory in nature. In the classroom, the children given colored concrete objects to manipulate as they learnt mathematics. Abacus and pocket folders were handy in establishing the number value concept and operations. These learning materials are nick named ‘magical kits’. Since children MD have problems in

comprehending abstract mathematics operations, they needed explicit examples to illustrate the operations. For instance through manipulation of different concrete materials they appreciated the fact that addition and multiplication concepts involved combinations which increased while subtraction and division concepts involved partitioning materials leading to a decrease.

The language of communication used was developmentally appropriate and simplified for easier understanding. For instance, pragmatic or quantifiable language was used such as; put together for addition; take away for subtraction, sharing equally for division. The language of communication was developmentally appropriate and simplified for easier understanding. For instance, pragmatic language was used such as; put together for addition; take away for subtraction, sharing equally for division. Kiswahili as mother tongue in cosmopolitan areas was used together with the simplified English version. Verbal problems were introduced when children had mastered numbers, signs and space. Teaching pre operational skills which included; teaching grouping, categorization, comparison and sequencing numbers (smallest to highest). Children were provided with a lot of concrete materials collected from the local environment to classify basing on the attributes such as; size, shape and color. The children sorted and grouped the objects in rows and columns; big/small, long/short, more/less in either ascending or descending manner. The children were reinforced by claps, marking and scoring as well as recognition. The children were then taught number reading (in words), writing, recognition and value by use of concrete materials

and demonstrations. Follow up exercises were given to check the children's level of understanding and mastery.

Teaching operational skills included skills such as; place value, addition, subtraction, multiplication and division. Pocket folder and Abacus games were used to teach children on the mastery of place value. **Teaching place value:** The children grouped and re grouped the play materials severally. Different place values were represented by different colors. For instance, **whites** (Ones), **Blue** (Tens), **Red** (Hundreds) and **Green** (Thousands). Since children with MD find it difficult to write numbers with zeroes e.g (10001 for 1001, the use of pocket folders or abacus were useful.

The second method for teaching number value was the **split and write technique**. This involved dissecting numbers according to their place value. For, example 180=100+80+00; one hundred, eight tens and zero ones. The third approach is the use of **stair technique**. For instance; 888 is written as 800 sited on a chair, 80 and 8 sited on a chair each. Fundamental facts can be taught by using authentic methods of processing basic arithmetic skills. These are inculcated in form of activities and games involving retrieval from memory and reconstruction by fingers. Timed group competitions and activity oriented teaching enhance automatic mental operations. Introduction of group work in the class and during free time relieves mathematics anxiety and practice promotes mastery. The teacher- pupil relationship was very cordial to remove anxiety. The learners were

scaffolded to enable them handle sums that may have otherwise been difficult on their own (raised their Zone of Proximal Development (ZPD).

Addition: The single digit addition of tens and hundreds is taught first before the two digit ones. This is done to promote mental computation and holistic view of numbers. Personal flash cards and counters are used to help them memorize 'put together' better. The abacus and number value games helped in teaching mathematics with carrying over.

No carrying over concept: 13 +8=111, The child adds 3 with 8 and writes 111.

13
+ 8
111

The correct answer should be 21.

Teach the children how to carry over. Let them know that any number beyond ten is added to the next and so forth. They have to carry one from 11 to make the next number 20. Then plus 1 is equal to 21.

Subtraction: start the concept as taking away some items. The take away concept is achieved through manipulation of colored objects. Break down the numbers into place value units eg 110 is 1 (hundreds) 10 (tens) 0 (ones). Then subtract ones, tens, hundreds and thousands. Begin with subtraction without borrowing before introducing subtraction with borrowing. Use place value charts, abacus and pocket folders. Common subtraction error and how to solve them;

No place value concept: 13-8=15, The child subtracts 3 from 8 without carrying in a reversed way while the correct answer should be 5.

13
-8
15

No regrouping: 76-29=53, in the right column, the child subtracts 6 from 9 and then 2 from7 while it should be 47

76
-29
53

Problem with zero: 60-27=47, The child subtracts zero from 7 then 2 from 6 while its supposed to be 33.

60
-27
47

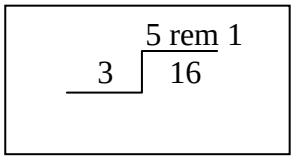
Subtracting alternate columns: 384-27=312, Child subtracts 7 from 8 and 2 from 4 while the correct answer should be 357.

384
- 27
312

Teach the children how to borrow. Let them know they cannot remove 7 from 4. They have to borrow one from 8 to make it 14. Then remove 7 from 14 making 7.

Division: Teach the children to understand that division means sharing objects into equal number of groups. Division operations are done to the left not to the right like addition, subtraction or multiplication. The common errors include;

No use of remainders: 821/3=5 rem one.



Multiplication

Arranging objects into specified groups like 3x2 means arranging three objects into two columns or groups. Children with MD find it hard to remember multiplication rules. This can be corrected by the **direct method:** where children are given different manipulative and pictorial representations. The task is then broken into small steps. For example, (18×9) can be tackled as (10×10+62). Children are also given probes, immediate feedback, diagrams and pictures, ample time for independent practice.

Fractions: is introduced in quantitative language as part of a whole. Give learners as many practical activities as possible in cutting or dividing objects into different kinds of fractions such as halves, thirds, quarters, eighths and tenths. Ask learners how many fractions an object can be divided into. For example; 7 can be divided into 6+1, 3+4, 5+2 etc.

The control group was not taught according to any remedial teaching program but attended the usual paid tuition that involved normal coverage of the syllabus.

The experimental group received a remedial teaching using many concrete materials to allow maximum exploration and manipulation before moving to abstract representation. The remedial teaching was given in the afternoons alongside the daily normal teaching. Each lesson was covered in thirty minutes just like the normal class lessons to assess the impact of remedial teaching (which was empirical learning with special magical kits) compared to direct teacher chalk method used by teachers in most cases. Then learners were given a break of two weeks to asses of understanding of the work before a posttest exam was administered to both the experimental and control groups.

Third Phase: Posttest exam was administered after two weeks of completing the remedial teaching. Both experimental and control groups were given the post remedial teaching test. Later, the post remedial test was marked and the results entered in a computer for further computations. The results for the pre-test and post-test of the two groups were computed and comparisons made to ascertain the effect of the remedial teaching/intervention on the mathematics difficulties. The influence of pupils' gender and type of school they attended was examined on their mathematics performance.

3.10 Data Analysis

The Statistical Package for Social Sciences (SPSS) was used to prepare and organize the data for analysis. Both qualitative and quantitative methods were be used to analyze the data. Descriptive and Inferential statistics were computed. Descriptive statistics calculated included; frequencies, means and percentages. Inferential statistics calculated was t-test at a significance level of 0.05. The following were the statistical hypotheses tested:

HO_1: There is no significant difference in mathematics performance between pupils with mathematics learning difficulties who receive remedial teaching and those who do not.

HO_2: There is no significant difference in performance between boys and girls with mathematics difficulties who receive remedial teaching.

HO_3: There is no significant difference in mathematics performance between pupils with mathematics difficulties in public and private primary schools who receive remedial teaching.

3.11 Logical and Ethical Considerations

The researcher was issued with an introductory letter from the School of Graduate Studies at Kenyatta University introducing him to the Permanent Secretary Ministry of Higher Education, Science and Technology and any other relevant authorities who needed be notified, before commencing data collection. Respondents' confidentiality was ensured through the anonymity principle of not

requiring them to write their names on the questionnaires. They were also assured that the information they give was to be treated confidential. The ethical consideration involved explaining to the head teachers, class three teachers and parents the purpose and method of data collection. This was to ensure consent before collecting data. The remedial teaching program was given to the control group for later use.

CHAPTER FOUR

FINDINGS AND DISCUSSIONS

4.1 Introduction

This chapter presents the results of the study. First it highlights the demographic information and then results together with discussion of the results according to the objectives and hypotheses of the study.

The objectives to be achieved were to;

i) Find out if there was early identification of children with Mathematics Difficulties in Butere District.
ii) Establish the common forms of Mathematics Difficulties children identified with MD in Butere District experienced.
iii) Find out if there was remedial teaching for pupils with mathematics difficulties in lower primary school.
iv) Administer and investigate the effect of the remedial teaching program on pupils' mathematics performance.

4.2 Demographic Information

In this study, 8 class three teachers were involved in the study; four teachers from public primary schools and four from private primary schools. The demographic results are presented in the following subsections:

4.2.1 Teachers' Demographic Information

The demographic information required from the class three teachers who participated in the study included: Type of school, gender, professional qualifications, SMASSE training , competence in teaching mathematics, scores in mathematics, interest in teaching mathematics, teaching experience, teacher pupil ratio and number of repeaters in their classes.

4.2.1.1 Type of school

The class three teachers were asked to state whether they taught in a public or private primary school. Table 4.1 presents the findings of the type of school the teachers taught.

Table 4.1: Type of the school

		Frequency	**Percent**
Valid	Private	04	50.0
	Public	04	50.0
	Total	08	100.0

Table 4.1 reveals that an equal number of teachers (04) involved in the study were from public and private primary schools respectively. This could be attributed to the fact that the researcher wanted to have an equal number of private and public primary schools in the study. However, from the available data (Table 3.1) there were more public schools in Butere (91%) than the private schools (09%). The total number of primary schools in the district was 82. Elsewhere from the literature reviewed, Gathara (2012) did a comparative study on KCPE

performance between public and private schools in Imenti Central while Ochenje (2008) sought to establish the factors influencing academic performance of public and private schools in Kitale municipality. In both studies, private schools did better than the public ones.

4.2.1.2 Gender

The teachers' gender was also determined. Table 4.2 presents the findings on distribution of teachers by gender.

Table 4.2: Teachers' Gender

		Frequency	Percent
Valid	Male	2	25.0
	Female	6	75.0
	Total	8	100.0

Table 4.2 reveals that out of the 8 teachers who participated in the study, six were female teachers while the remaining teachers two were male. This means that lower primary section had more female teachers than the male ones. This may be as result of cultural biasness in Butere District which considered child care activities to be female responsibility and hence men shunned it. The implication will be that the male child may lack male or father figure mentorship at school bearing in mind that some children come from single parent families headed by the mother. However, the results of this study did not corroborate with a national survey done by KNEC (2010) on distribution of teachers by gender in primary

schools and which revealed that there were more male teachers (64%) than female teachers. According to the Kenyan EFA Assessment report Two, the gender parity index (GPI) for the teaching force in 2010 was 0.55 at primary in favor of male teachers. This means that most male teachers preferred teaching in upper primary. This means that most male teachers may have preferred to teach in upper primary.

Another study done by UNESCO (2011) in secondary schools on teacher distribution by gender also showed that there were more male teachers than females. According to this Report there was a high gender disparity favoring male teachers to females in the teaching of mathematics and sciences at the secondary level. Also, many girls enrolled in secondary schools did not complete the cycle due to gender insensitive teaching practices as well as shortage of female teachers as role models. The Kenyan EFA Assessment report Two, the gender parity index (GPI) for the teaching force in 2010 was at 0.60 at secondary in favor of male teachers. This indicated a relatively male dominated teaching force

4.2.1.3 Professional Training

In this section the teachers were asked to indicate their highest level of training ie whether they had attained training at MED,BED, DIPLOMA or CERTIFICATE IN PTE,ECD,SNE or PRIMARY OPTION Table 4.3 presents the findings of the study

Table 4.3: Professional Training

		Frequency	Percent
Valid	Certificate	5	62.5
	Diploma	2	25.5
	Degree	1	12.5
	Total	8	100.0

Table 4.3 shows that five teachers (62.5%) had trained at certificate level while two (25.5%) were at Diploma and one (12.5%) at Degree level respectively. This means that most teachers may not have attained good quality grades to warrant higher professional training as teachers. The findings of this study were in tune with those by KNEC (2010) which indicated that teachers with high professional qualifications did better than those with low grades. Therefore, the above findings seemed to corroborate with UNESCO (2005) which revealed that large numbers of primary school teachers lack adequate academic qualifications to pursue high professional study.

Hawley (2002) compared the performance of well-educated teachers with less educated teachers. The results showed achievement gains for students with well-educated teachers. They also showed that achievement was related to teachers' knowledge of the subjects taught. Lack of quality grades in the key subjects limits the teachers' ability to motivate and empower learners with adequate skills in their education. According to Darling-Hammond (2000), subject-matter knowledge has often been found to be an important factor in teacher

effectiveness. It exerts a positive effect up to a threshold level and then tapers off in influence. Measures of pedagogical knowledge including knowledge of learning, teaching methods and curriculum have more often been found to influence teaching performance, and frequently these factors exert even stronger effects than subject matter knowledge. Therefore, the lack of quality grades among the teachers may in the long run deny leaner's adequate training and empowerment with relevant skills to achieve the 2030 vision and MDGs.

4.2.1.4 Training in SMASSE

The researcher sought to establish whether class three mathematics teachers had undergone SMASSE training like their colleagues in the upper primary sector. To achieve this, teachers were asked to state whether they were SMASSE trained. Those were not SMASSE trained to state the reasons for having not trained in SMASSE. Table 4.4 presents the findings.

Table 4.4: SMASSE Training

		Frequency	**Percent**
Valid	No	08	100.0
	Yes	00	00.0
	Total	08	100.0

Table 4.4 indicates that all teachers (100%) involved in this study had not undergone SMASSE training. This means they lacked the necessary pedagogical skills not only to identify but also to offer remedial teaching to learners with Mathematical Difficulties. The findings of this study had a slight deviation from

those done by Giku (2010) on early identification of learners with Dyslexia. It was revealed that at least 32% of the teachers involved in the study had undergone training in Special Needs education. However, both act as a pointer to the fact that for us to ensure education for all including the learners with MD education there is need to ensure all teachers are trained in SMASSE training to equip them with the necessary pedagogical skills needed to handle learners with MD. There is evidence that in-service training may be positively related to student achievement (August and Lavy, 1998 as cited by Bambico, 2001). Other studies by Willy and Yoon (1995) as cited by Murnaame & Phillips (1981) established that there existed a positive correlation between certain types of in-service training such as working with different student populations and higher order thinking as relating to student academic performance.

4.2.1.5 Reasons for lacking SMASSE training

The teachers were further asked to explain why they had not undergone the SMASSE training whose main aim is to empower teachers of Sciences and Mathematics with appropriate skills to enable them effectively handle learners in these subjects. Table 4.5 presents these findings.

Table 4 5: Reasons for not having undergone SMASSE training

		Frequency	Percent
Valid	Teach lower classes while SMASSE is on upper classes	04	50.0
	Never given the opportunity	03	37.5
	College commitments	01	22.5
	Total	**08**	**100.0**

Table 4.5 revealed that half of the teachers (50%) had not undergone SMASSE training due to the fact that they were teaching lower primary and therefore could not be sponsored to train for SMASSE. The other three teachers (37.5%) said that although they were willing to train they had not been given any training opportunity. The remaining one teacher (22.5%) was undergoing training in another college. This means the teacher that was already undergoing training in a different field. Nonetheless, lack of SMASSE training was an impediment to the teachers' effective early identification and intervention of MD. Consequently, pupils' poor mathematics achievement may not be alleviated.

4.2.1.6. Competence in Teaching Mathematics

The study sought to find out the opinion of mathematics teachers concerning their competence in teaching mathematics. A closed ended question was posed to them seeking a yes or no answer. Table 4.6 presents the findings of the study.

Table 4.6: Competence in Teaching Mathematics

		Frequency	Percent
Valid	Yes	08	100.0
	No	00	00.0
	Total	08	100.0

Table 4.6 indicates that all respondents felt that they were competent enough in teaching mathematics. This means they voluntarily chose to teach mathematics and could easily identify any strange behavior and offer remedial teaching. These findings contradicted those of Giku (2010) which sought to measure teachers' level of competence in handling dyslexics. They were to indicate whether they felt competent or not in handling dyslexics. Most teachers felt they lacked confidence in handling dyslexics because they were ill prepared to handle such cases. Thorton (1983) noted in a longitudinal study that well-qualified teachers had a significant influence on high school students' achievement in mathematics and science. This study therefore, endeavoured to establish if teachers' 'had necessary competencies to offer Remedial Teaching.

4.2.1.7 Score in Mathematics

The researcher also determined the grades the teachers scored in mathematics in their highest academic level. Figure 4.1 presents the findings of the study.

Figure 4.1: Score in Mathematics

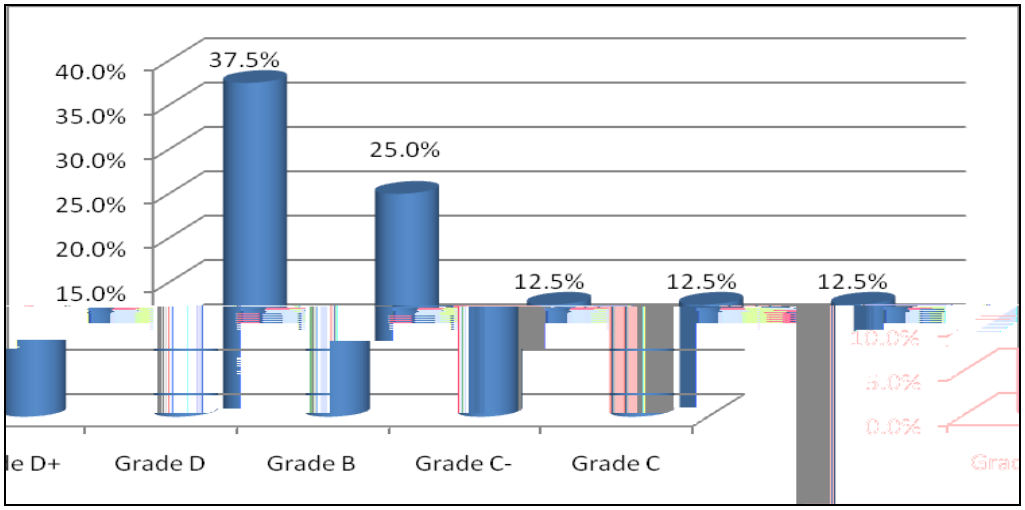


Figure 4.1 reveals that three teachers out of eight (37.5%) had grade D plus, two teachers (25%) scored grade D plain. The remaining three teachers scored grades C- (minus), C (plain) and B (plain) in their highest academic level respectively. Therefore, five out of eight teachers (62.5%) scored low grades of D and D+ plus. This means that most mathematics teachers had weak academic grades in mathematics and were unlikely going to teach mathematics effectively. The findings of this study agreed with those of Everson, Hawley & Zlotnik (1985) as cited by Aguele (1996) which compared well-educated teachers with less educated teachers. The results showed achievement gains for students with well-educated teachers. They also showed that achievement was related to teachers' knowledge of the subjects taught. Lack of quality grades in the key subjects limits the teachers' ability to motivate and empower learners with adequate skills in their education. According to Darling-Hammond (2000), teachers with high academic grades have good subject-matter knowledge which is often found to be an important factor in teacher effectiveness. Good grades determine pedagogical

knowledge including knowledge of learning, teaching methods and curriculum which have often been found to influence teaching performance.

4.2.1.8 Teaching Experience

Concerning the number of years the teachers had taught, they had to indicate by ticking whether they had taught for a duration range of 1-5, 6-10 or more than 15 years. Figure 4.2 presents the results of the study.

Figure 4.2: Teaching experience

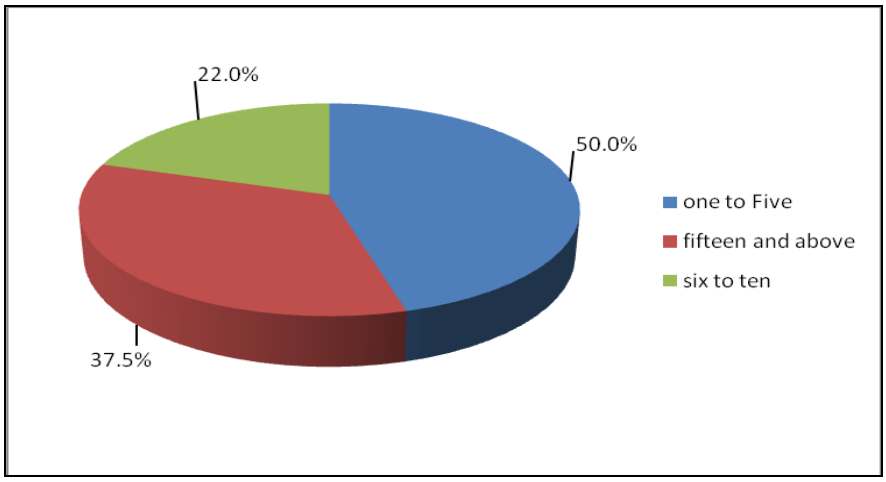


Figure 4.2 indicates that half of the teachers (50%) involved in the study had taught for a period of less than five years (1-5) and (37.5%) having taught for more than fifteen years. Based on these results, half of the class three teachers had taught for less than five years and therefore, were less experienced. The implication is that they were likely to lack the ability in identifying pupils with MD and give Remedial Teaching.

Studies done by Murname & Phillips (1981) and Klitgard & Hall as cited by Bambico (2001) on giving remedial teaching to pupils with reading problems revealed that teachers with less than 5 years teaching experience were less efficient than those who had more experience. This means that these less experienced teachers may not have the necessary competencies to give remedial teaching to pupils with MD as well. This finding is strengthened by the research study in the US done by Bambico (2001) on the Influence of Teachers' personal variables to pupils' mathematics achievement and instruction skills revealed that there was a positive relationship between teaching experience and student achievement in mathematics. This means that most experienced teachers produced better results than less experienced ones. This could be attributed to the fact that they could also easily identify MD and give Remedial Teaching.

Further research studies done by KNEC (2010) and Darling-Hammond, (1999) revealed that experienced teachers (from lengthy teaching duration) were efficient in mathematics teaching and could also easily offer Remedial Teaching unlike the less experienced teachers. In another study done by Khakasa (2012) on factors that influence secondary school teachers' attitude towards G/C program it was revealed that more experienced (elderly) teachers served better in G/C owing to their wealth of experience in teaching. This study sought to establish the influence of teaching experience on early identification and intervention of MD.

4.2.1.9 Teacher-pupil Ratio

Teachers were asked to state how many boys they had in their class. Table 4.7 presents findings on the number of boys and girls in class threes in the sampled schools.

Table 4.7: Pupils in class three

School type	Respondents	Boys	Girls
Private (X)	X1	30	38
	X2	34	45
	X3	10	06
	X4	34	50
TOTALS		**108**	**139**
Public (Y)			
	Y1	75	68
	Y2	21	27
	Y3	37	40
	Y4	59	80
TOTALS		**192**	**215**
Overall Totals		300	354

Table 4.7 reveals that there were six hundred and fifty four (654) children in class three being handled by eight teachers only. This meant that each teacher handled about 82 learners per class. The implication is that there was a very high teacher pupil ratio (1:82) which could impede effective teacher pupil interaction. Such high teacher pupil ratio forced teachers to use private tuition to remedial teaching. The findings of this study seemed to corroborate with those of Uwezo Kenya (2010) whose aim was to establish the learning conditions after the introduction of free primary education. The findings of the study revealed that most classes were overcrowded with over sixty children under one roof. Another study KNEC (2010) also revealed that most schools were overcrowded with as many as sixty children being handled by one teacher. Wafula's study of (2009) on Early

identification of class three pupils with LD in the public primary schools in Butere, to establish if there was early identification of LD in the public primary schools and factors that hindered successful early identification of LD revealed that there was overcrowding in most classes having as many as 60 children owing to free primary education. Therefore, with these congestions in class, some questions arise; do teachers have any individual contact with learners to observe any learning difficulties, is there any space to conduct group work for peer tutoring, do teachers have any time to conduct remedial teaching for learners with mathematics or give sufficient exercises and mark on time?

4.2.1.10 Repeaters

Class three teachers were asked to indicate the number of pupils who were repeating class three at the time of the study. Table 4.8 presents the findings of this study.

Table 4.8: Repeaters

School type	Respondents	Boys	Girls
Private (X)	X1	04	02
	X2	03	06
	X3	01	00
	X4	02	01
TOTALS		**10**	**09**
Public (Y)			
	Y1	08	06
	Y2	05	04
	Y3	07	07
	Y4	00	01
TOTALS		**20**	**18**
Overall Totals		30	27

Table 4.8 postulates that there were more boys repeating class three (30) than girls (27). This could be attributed to inadequate mastery of mathematics concepts by the learners with MD due to incompetence of teachers in terms of pedagogical skills. Also, the government policy directive outlawing repetition of classes has not been adhered to. Consequently, about ten percent (10%) boys and girls respectively repeated class three. This number is quite significant meaning there is a high rate of repetition of learners in this area. The implication is that teachers are still forcing children to repeat classes contrary to the government directive that no children should be made to repeat any class. Also, this could be why there are many learners aged beyond the requisite age of eight years and thus making it hard for effective intervention. These findings corroborated with the study by KNEC (2010) on mathematics performance of STD 3 which indicated that about 59.8% (more than half) of class three pupils had repeated class three leading to many cases of over age children (44%) in class three. Studies reviewed indicated that effective early intervention occurred at nine years or below. Therefore, repetition made children grow older and thus making early intervention of MD less efficient. There is need therefore, to ensure that the Government policy outlawing repetition is implemented to deter this hindrance of effective early intervention programmes.

4.2.2 Pupils' Demographic Information

The demographic information required from the pupils who participated in the study included; Distribution according to: age, gender, father's occupation,

mother's occupation, children's birth position and the family size (number of siblings the child has). The findings of this study are presented as follows;

4.2.2.1 Age

The respondent was to indicate the age of the child experiencing mathematics difficulties. Table 4.9 presents the findings of the study

Table 4.9: Age

School Type	Responses in years	Frequency	Percentage
Public (Y)	7 YRS	02	2.50
	8YRS	04	5.00
	9YRS	08	10.00
	10 YRS	10	12.50
	11 YRS	10	12.50
	12 YRS and Above	06	7.50
TOTALS		**40**	**50.00**
Private (X)	7YRS	00	00
	8YRS	03	3.75
	9YRS	18	22.50
	10 YRS	15	18.75
	11 YRS	04	5.00
	12 YRS	00	0.00
TOTALS		**40**	**50.00**
Overall		80	100.00

Table 4.9 reveals that most learners (33%) in the public schools were age above nine years which is the ideal age for effective early intervention of MD. The remaining (17%) were aged 8 to 9 years respectively. In the private schools, most learners (25%) were aged 10 and 11 years. The rest were aged below 9 years. The recommended age for a STD3 three pupil according to the Ministry Of Education is 8-9 years. The findings of this study imply that a number of pupils in the public and private schools were over age. The presence of most children aged above 9

years (58%) in both private and public schools could be attributed to them enrolling for school late or due to forced repetition in this area (Table 4.25). This means that some children who are older may have repeated severally making them to delay in their primary education.

However, relevant literature reviewed indicated that effective early intervention occurs at 9 years and below. Therefore, the older the children, the lesser effective the remedial teaching programme on MD. Consequently, the twenty six learners out of the total sample in the public and nineteen pupils out of forty in the private schools respectively are out growing the effective early intervention stage.

The national survey conducted by KNEC (2010) on mathematics performance of STD 3 pupils which showed that about forty four percent (44%) of pupils in class three were aged (10 years and above). Other studies reviewed indicate that old age did not only influence achievement but also effective intervention of MD. According to Lacovou (2001) as students become older, achievement diminishes because there is a negative relationship between age and school achievement (Van Ejick, 1993). Meaning as the children grew in age, their achievement declined. There is need therefore, to ensure that all pupils are enrolled in schools at the appropriate age (6 years for primary) and the ministry directive outlawing forced repetition is adhered to. This will in the long run promote both early identification and intervention of MD among school pupils for effective learning and eventual academic success. Hence this study wanted to establish how selective factors such as age influenced the effectiveness of the remedial teaching for pupils with MD.

4.2.2.2 Gender

The respondent was to indicate the gender of the child experiencing mathematics difficulties. Table 4.10 presents the findings of the study.

Table 4.10: Gender

School Type	Responses	Frequency	Percentage
Private (X)	Male	23	28.75
	Female	17	22.25
TOTALS		**40**	**50.00**
Public (Y)	Male	22	27.50
	Female	18	22.50
TOTALS		**40**	**50.00**
Overall Totals		80	100.00

Table 4.10 indicates that more than half (50%) of pupils identified with MD were boys. This means that more boys than girls were identified with MD. The studies reviewed did not give a breakdown of how many boys and girls were respectively were identified with MD. For instance, studies conducted in the US by Jordan (2010) and Geary (2004) revealed that 6-10% of all pupils enrolled in the lower grades were experiencing MD. According to Chadha (2001) 7-15% of all learners in India were experiencing MD. In Kenya, Kinyua (2007), Wafula (2009) and Uwezo Kenya (2010) established that 20-24% of learners are experienced learning difficulties especially in mathematics. Therefore, this study sought to establish the influence of gender on the number of pupils identified with MD and effectiveness of the remedial teaching for pupils with MD. The findings revealed that more boys than girls were identified with MD and gender did not cause a

significant difference in the mathematics performance of pupils with MD who received remedial teaching.

4.2.2.3 Fathers' Occupation

This study wanted to establish the kind of work the fathers of children with mathematics difficulties were engaged in to earn a living and consequently support their children's education. The findings of this study are presented in Table 4.11.

Table 4.11 Fathers Occupation

Responses	PUBLIC		PRIVATE	
	FREQ	PERCENTAGE	FREQ	PERCENTAGE
Farmer	25	62.5	18	45
Cobbler	3	7.5	1	2.5
Teacher	2	5	5	12.5
Carpenter	2	5	1	2.5
Mason	2	5	4	10
Boda Boda	2	5	1	2.5
Businessman	1	2.5	5	12.5
Manamba/tout	1	2.5	1	2.5
Pastor	1	2.5	1	2.5
Cane cutter	1	2.5	3	7.5
Total	40	100	40	100

Table 4.11 indicates that most fathers of children with MD (from both public and private schools) were peasant farmers (62.5% and 45%) respectively. The other remaining were self employed in the informal sector with only a few having formal employments as teaching This means that most families did not have stable income.. Consequently, there was a high probability of high poverty rate in the region making educating children a difficult venture.

The results of this study corroborated with studies done by Sinnes, 2005 & Coolican (1996) indicating that parental socio-economic status (SES) affected children's academic performance. This is so because students whose parents had high socio-economic status enjoyed motivational intervention such as extra home coaching, had an enriched home environment with tutorial disks and programmes available in video, good library and better state of mental health. Their less fortunate counterparts were highly stressed and exploited at home through engagements in domestic tasks leaving little time for studies. Also, most parents with high SES took their children to private schools which were highly characterized by effective teaching, good instructional supervision and the other advantages of small-scale operation and more manageable teacher-pupil ratio. This could not be said of public schools. It was very likely therefore that the environmental disadvantage, coupled with persistent shortage of basic requirements in public schools disadvantaged these children's academic performance; most of whom were from poor backgrounds. This study therefore, wanted to establish whether fathers' occupation affected early intervention of pupils with MD. However, there is need to investigate how the direct influence of SES on mathematics performance of pupils with MD.

4.2.2.4 Mothers' Occupation

This study wanted to establish the kind of work the mothers of children with mathematics difficulties were engaged in to earn a living and consequently

support their children's education. The findings of this study are presented in Table 4.12.

Table 4.12 Mothers Occupation

Responses	PUBLIC		PRIVATE	
	FREQ	PERCENTAGE	FREQ	PERCENTAGE
Housewife	16	40	12	30
Businessman	5	12.5	10	25
Farmer	5	12.5	4	10
Teacher	2	5	5	12.5
Hair dresser	2	5	2	5
Housemaid	4	10	1	2.5
Cook	2	5	4	10
Tailor	2	5	1	2.5
Nurse	2	5	1	2.5
Total	40	100	40	100

Table 4.12 reveals that most mothers of pupils with MD (from both public and private schools) were house wives (40 and 30%) respectively. The remaining were engaged in business, in the informal sector with only a few having formal employment such as teaching. This means most families lacked financial stability leading to a high poverty rate in the region.

Studies indicate that mothers' level of education and employment family played a fundamental role in child's academic performance and score (Tucker, Hans, Brandy& Herman, 1996). It also greatly influenced adolescent's educational outcomes as well (Rhea & Otto, 2001). Students who reported higher maternal

educational level tended to have higher average scores. Maternal educational status and employment acted as an indicator of SES: a mirror reflection of their potential for socio-economic resources such as household incomes that were available to the student. Income and education were highly correlated in the US (Hauser & Warren, 1997). When income was examined as a separate variable, the research showed a consistent positive relationship between maternal income and student achievement.

In the studies done by OECD (2007) the mother's level of education was found to be the most critical variable as far as the children's education is concerned. All in all, the family SES was the most fundamental variable than others (Fan, 2001). Students from low SES background were at a higher risk in view of their mathematics performance (Coleman et al, 1966).

In other related studies, Hill and O'neil, (1994) found out that increasing family income by $10,000 by dollars per year is associated with an increase in a student's achievement of 2.4 percentile points. In Kenya, the national survey by KNEC indicated that 51% of pupils in STD 3 were assisted in their homework by their mothers most of whom had some basic education. Therefore, maternal education level and economic status is vital in effective intervention of mathematics difficulties. However, further studies need to be done to show the direct relationship between maternal educational level and economic status on intervention of MD.

4.2.2.5 Birth Position

This study sought to find out the birth position of children with MD. The findings of this study are presented in Table 4 13.

Table 4.13: Distribution of Children according to their birth position

School Type	Responses	Frequency	Percentage
Public (Y)	1ST	14	17.50
	2ND	06	7.50
	3RD	09	11.25
	4TH	06	7.50
	5TH	02	2.50
	6TH	03	3.75
TOTALS		**40**	**50.00**
Private (X)	1ST	09	11.25
	2ND	10	12.50
	3RD	07	8.75
	4TH	02	2.50
	5TH	08	10.00
	6TH	04	5.00
TOTALS		**40**	**50.00**
Overall Totals		80	100.00

Table 4.13 revealed that majority of the pupils with MD in both public and private were first borne (17.5%) and (11.5%) respectively. This means that most of the pupils with MD were in the top ordinal positions. It was expected that these children received warm and good nurture unlike their peers in the subsequent birth positions who were neglected as parents went fending for food.

These results did not corroborate with studies of Adler as cited in Uba (1989) that the children in the first birth order or the oldest child was usually advantaged by a good deal of warmth during the early stages of life which he enjoyed alone.

Observations and studies indicated that more time and attention were usually accorded to the first borns. Attention by parents decreased as the number of children increased and that's why later born children performed poorer than their older siblings. Other studies conducted on the relationship between academic achievement and birth order have shown that there were positive relationships. For instance, Leorna (1982) established that first born and only children were significantly more creative on verbal test of creativity than later born. Nwafar and Ango (1988) observed that there was more significantly outstanding academic performance amongst first born than later born. Children born in later birth order did worse than those in high birth order. However, the findings of this study did not indicate the same state, hence the need to conduct further studies on the relationship between birth order, the cause and intervention of MD.

4.2.2.6 Family Size

This study was geared towards finding out the number of brothers and sisters the child with mathematics difficulties had Table 4:14 presents the findings of this study.

Table 4.14: Family Size

School Type	Responses (No of children per family)	Frequency	Percentage
Public (Y)	1 – 3	11	13.75
	4-6	14	17.50
	7- 9	13	16.25
	10 and above	02	2.50
TOTALS		**40**	**50.00**
Private (X)	1 -3	10	12.50
	4 -6	21	26.25
	7 – 9 D	07	8.75
	10 and above	02	2.50
TOTALS		**40**	**50.00**
Overall Totals		80	100.00

Table 4.14 reveals that 38 children out 40 from public schools came from large families with siblings ranging from 1-9. In the private sector just like in the public schools, 38 children with MD came from large families with children ranging from 1-9. The implication is that parents with many children were more involved in fending for food than following their educational progress. This seemed to be supported by the information from reviewed literature which depicted children from larger families as worse performers than those from smaller families (Howard and Kee, 2006). The findings of their study showed that there is a significant difference between the family size and performance of students in higher institutions. This could be attributed to the fact that parents with many children lacked time and money to input in them. The more children there are in

the family, the lesser of both time and money to invest in the children. Inputs are not money alone, but other essential things like time, attention, resources diversion and so on. (Powell and Steadman, 1993; Van, Ejick and De Graaf, 1995).

Other studies by Lacovou (2001) reveal that children from larger families have lower levels of IQ and consequently perform worse than children from smaller families. It should also be noted that majority of the parents had low status occupations. See Tables 4.5 and 4.6 on fathers and mothers occupations. Therefore, there seems to be a correlation between occurrence of MD and family size. Further studies need to done to establish the exact relationship between the two.

4.3 Early Identification of Children with MD in Butere District

Objective one sought to find out if there was Early Identification of Mathematics Difficulties in Butere District. These results are presented in the following subsections:

4.3.1 Identification of pupils with Mathematics Difficulties

Class three teachers were asked to indicate whether they identified MD or not. Table 4.15 presents the results of this study.

Table 4.15: Identifying MD

School Type	Responses	Frequency	Percentage
Private (X)	Yes	04	50
	No	00	00
TOTALS		**04**	**50**
Public (Y)	Yes	04	50
	No	00	00
TOTALS		**04**	**50**
Overall Totals		08	100

Table 4.15 reveals that all teachers in both public and private schools said they identified pupils with MD. Elsewhere from the literature reviewed, there was early identification of MD. For instance in the US studies by Learner (2006) and Jordan (2010) reveal that about 6-10% children experience mathematics difficulties which make them struggle in their education. In India according to Chadha (2001) and Pandey (1985) 1-15% children in the lower classes experience MD. In Kenya studies by Uwezo Kenya (2010) revealed that about seven out of every ten children in lower primary school lacked the necessary mathematics skills to move to the next level. Consequently, many children were graduating to the next class without the requisite skills to learn mathematics in that level. Hence this study sought to establish if teachers identified MD in Kenya.

4.3.2 Methods of Identifying Pupils with MD

Class three teachers were asked to indicate the methods they used to identifying pupils with MD in their classes. Table 4.16 presents the findings of this study.

Table 4.16: Methods of identifying Pupils with MD

School Type	Responses	Frequency	Percentage
Private (X)	Direct observation	02	25
	Parents' concerns	01	12.5
	Ruling out major problems (differential diagnosis)	01	12.5
TOTALS		**04**	**50**
Public (Y)	Parents' concerns	02	25
	Direct observation	02	25
TOTALS		**04**	**50**
Overall Totals		08	100

Table 4.16 indicates that teachers in private schools mostly used direct observation to identify pupils with MD whereas those in public schools used direct observation and parents' concerns. From the other studies reviewed in India for instance, teachers used differential diagnosis, direct observation and recognizing students strengths (Chadha, 2001) while according to Lavine (2003) teachers used a cluster of strengths, assessment and direct observation to identify learners with MD. In Kenya according to Wafula (2009) teachers used Differential Diagnosis, observations, parents concerns and Cluster of characteristics to identify LD in mathematics. This study had sought to find out the methods teachers used to identify MD in Butere District Kenya.

4.4 Common Forms of Mathematics Difficulties

Objective two sought to find out the common kinds of MD pupils they experienced. Class three teachers were asked to indicate the common forms of

mathematics difficulties that their learners experienced Table 4.17 presents the findings of this study.

Table 4.17: Teachers perception of Common Forms of MD experienced

Dichotomy label	**Count**	**Responses**	**Cases**
General difficulties	26	11.3	29.9
Carrying over in addition	47	20.3	54.0
Borrowing in subtraction	47	20.3	54.0
Alignment of digits	20	8.7	23.0
Time	18	7.8	20.7
Fractions	18	7.8	20.7
Word problems	18	7.8	20.7
Subtraction	14	6.1	16.1
Division	14	6.1	16.1
Number value	9	3.9	10.3
Total responses	**231**	**100.0**	

From Table 4.17 most teachers felt that most learners with MD experienced difficulties in addition with carrying over (20%), borrowing in subtraction (20%) and general mathematical difficulties. Other difficulties included incorrect alignment of mathematics digits, time, fractions, word problems, subtraction, division and number value. The findings of this study corroborates those of Learner in the US (2006) which revealed that children experiencing mathematics difficulties either experienced computational problems which included operations and oral word drills or reasoning which entailed poor discrimination of shapes and quantities or mastery of mathematics concepts. According to Fuchs, Fuchs & Prentice, (2004) children with MD experienced difficulties which included

finding difficulties in mathematics performance or rightly applying mathematics rules (Gearheart. 1985). Therefore, this study wanted to find out common mathematics difficulties learners experienced for effective early intervention by means of designing an ideal Individualized Educational Programme (IEP). Also, the researcher identified common mathematics errors committed by learners during mathematics in class and also analyzed in the subsequent table. Table 4.18 presents the findings of this study.

Table 4.18: Screened Forms of MD experienced

Dichotomy label	**Count**	**Responses**	**Cases**
Carrying over in addition	47	20.3	54.0
Division with remainder	47	20.3	54.0
Subtraction	26	11.3	29.9
Multiplication	20	8.7	23.0
Alignment of Digits	18	7.8	20.7
Fractions	18	7.8	20.7
Word problems	18	7.8	20.7
Subtraction	14	6.1	16.1
General difficulties	14	6.1	16.1
Number value	9	3.9	10.3
Total responses	**231**	**100.0**	

Table 4.17 indicates that most learners with MD committed errors in operational skills such as; difficulties in addition with carrying over (20%), division with reminders (20%) and subtraction with remainders (11.3%) and multiplication skills. Others included incorrect alignment of mathematics digits, fractions, word problems and place values which constituted pre operational skills. Unlike the

teachers perception of common forms of MD where there was no clear separation of pre and operational skills, direct observation and screening indicated more operational difficulties. However n both cases, addition with carrying over and subtraction with borrowing were common forms of MD. Therefore, there was need for remedial teaching anchored on pragmatic learning full of scaffolding to raise the learners' performance in mathematics.

4.5 The Remedial Teaching Programme for Pupils with MD

Objective three sought to find out if there was remedial programme for children with MD. Class three teachers were asked to indicate whether they had Remedial Teaching programme for pupils with MD or not. Table 4.19 presents the results of this study.

Table 4.19: Having Remedial Teaching Programme

School type	Responses	Frequency	Percentage
Private (X)	Yes	04	50
	No	00	00
TOTALS		**04**	**50**
Public (Y)	Yes	04	50
	No	00	00
TOTALS		**04**	**50**
Overall Totals		08	100

Table 4.19 reveals that all teachers in both private and public primary schools had Remedial teaching programmes for children identified with MD. From the literature reviewed, most teachers mostly conducted private tuition as the major

form of remedial teaching conducted For instance, in Asia, America, Europe and Africa (Bray, 2003). However, according to Raffick (2004) private tuition is majorly, necessitated by a heavy emphasis on exams forcing students to seek outside help. The pressure to excel in exams accentuates students and parents demand for tuition because all students are afraid of being overtaken by their peers. This therefore, did not fulfill the need for early intervention of MD which adversely affect the learners academic and career pursuit in the long run

4.5.1 Type of Remedial Teaching Programme Used

The type of Remedial teaching used for children with MD was also investigated and the results are presented in Table 4.20 below;

Table 4.20 Remedial Programme Used for MD by Type of School

School Type	Responses	Frequency	Percentage
Private (X)	paid private tuition	03	37.5
	Multi sensory approach	01	12.5
TOTALS		**04**	**50**
Public (Y)	Paid private tuition	02	25
	Teaching in ability groups	01	
	Multi sensory approach-many l/aids	01	12.5
TOTALS		**04**	**50**
Overall Totals		08	100

Table 4.20 indicates that most teachers in both private and public schools conducted paid tuition as a way of helping children with mathematics difficulties. They also used multi sensory approaches, and ability groupings. This means that

most schools had paid tuition. However, literature studies indicated that paid tuition was not necessitated by the need for early intervention of MD but a heavy emphasis on exams which forced students and parents to demand for it. The private tuition was not even well designed to help learners with MD but merely covered the normal syllabus as shown by studies done by Mburugu (2011). The study further revealed that private tuition was done in most schools.

Teachers taught children in their schools and at times in other venues outside the school compound. The tuition was paid on hourly or session basis (ranging from 1000-1500 and in some cases higher than that). The subjects taught mostly in tuition were those considered important like mathematics, language and sciences. The lesson duration was too long spanning for a period of 1-2 hours or at times more. The work done was just the normal syllabus and it was not designed for any special needs. The classes were usually overcrowded with as many 50 students and more. Further research by Wanyama and Njeru (2004) revealed that besides the private tuition was being done over the weekends; it could also be done after formal classes in the evening when children were already tired or during school holidays. This therefore, raises the question of effectiveness in helping children with MD. Consequently, this study, wanted to find out if teachers had designed special remedial teaching programmes for pupils with MD.

4.5.2 Time of Remedial Teaching

Class three teachers were asked to indicate the time they conducted Remedial Teaching programme. Table 4.21 presents the findings of this study.

Table 4.21: Time of remedial teaching

		Frequency	Percent	Percent
Valid	In the afternoon	67	77.0	77.0
	During vocations and Saturdays	6	6.9	6.9
	Morning before formal lessons	14	16.1	16.1
	Total	87	100.0	100.0

Table 4.21 reveals that most teachers conducted remedial classes for children with MD in the afternoons (77%) or in the morning before formal class lessons (16%). The remaining group of teachers conducted tuition over the weekends or during the school holidays. Elsewhere the literature reviewed indicate that the time for the tuition is usually over the weekends, after formal classes in the evening when children are already tired or during school holidays (Wanyama and Njeru, 2004). This therefore, meant that there was need to prepare special tuition programmes for pupils with MD to enable them learn like their peers because the tuition was done at a time when the learners were already tired from the busy day's activities hence its impact was be hampered. The study intended to find out the time of remedial teaching with MD to establish if there was clear school or government policies on how to manage remedial teaching programmes for effective intervention of pupils with MD.

4.6 Effect of the Remedial Teaching Programme on Mathematics Performance of Pupils with MD

Objective four sought to investigate the effect of the remedial teaching programme on the mathematics performance of pupils with MD in the experimental and control groups. Table 4.22 reveals the results of study

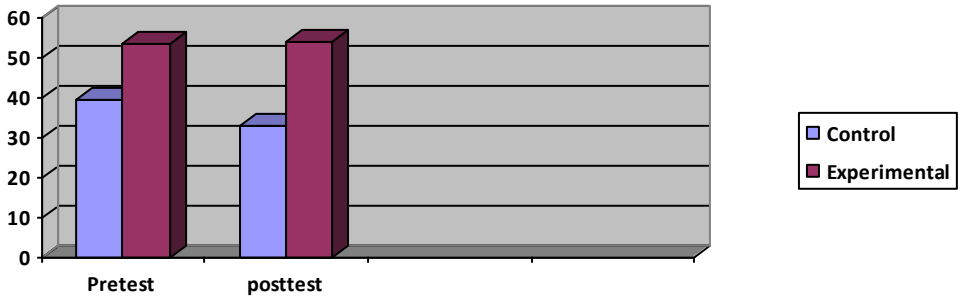
Table 4.22: Impact of Remedial Teaching on the Control and Experimental Group

	Group	N	Mean	Std. Deviation	Std. Error Mean
Posttest	Experimental	40	53.9231	22.30693	3.57197
	Control	40	33.0352	21.95656	3.16916
Pretest	Experimental	40	53.4872	21.93636	3.51263
	Control	40	39.2917	14.68529	2.11964

Table 4.22 indicates that the mean of the experimental group improved from 53.487 to 53.923 whereas the mean of the control group dropped from 39.291 to 33.035. There was a slight increase in the Std Deviation of the experimental group from 21.936 to 22.306 meaning there was increase in lower marks towards the mean which led to an improvement in the overall mean. The scores were closer to the mean. The std deviation of the control group increased greatly from 14.685 to 21.956 meaning that a number of learners dropped in their average marks leading to a decrease in the overall mean of the control group. Hence the remedial

teaching had a positive impact to the learners' score in mathematics. This is further illustrated by the figure below.

Figure 4.3: The Effect of remedial on the control and experimental group



The results in figure 4.3 indicate that there is a significant difference in mathematics performance between pupils with mathematics learning difficulties in the experimental and the control (who receive remedial teaching and those who do not).

Further statistical tests were done to establish the relationship between the performance of children with MD who received remedial teaching and those who did not was tested for significance using the T-test. To this end, the following hypothesis was formulated *H1: There is no significant difference in mathematics performance between pupils with mathematics learning difficulties who receive remedial teaching and those who do not.*

The difference is observed in both pretests and post test results. The t test for independent samples was used to test whether the difference was significant and the results are presented in Table 4.23 below;

Table 4.23: Independent Samples t Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
POSTTEST	Equal variances assumed	.53	.47	4.4	85	.000	20.8879	4.76729	11.40922	30.36652
	Equal variances not assumed			4.4	80.7	.000	20.8879	4.77520	11.38648	30.38926
PRETEST	Equal variances assumed	10.43	.00	3.6	85	.001	14.1955	3.94205	6.35766	22.03336
	Equal variances not assumed			3.5	63.9	.001	14.1955	4.10261	5.99927	22.39175

Table 4.23 reveals that the (t=4.38, df=85 at a P value < 0.001) was highly significant. The lower P value than 0.005 indicates that there is a significant difference between the performance of the experimental and control groups during the post test. Therefore, the null hypothesis stating that *there is no significant difference in mathematics performance between pupils with mathematics learning difficulties who receive remedial teaching and those who do not* is rejected. This implies that the Remedial Teaching programme enabled children with MD to perform better as shown by the scanned documents in the pre and posttests below;

4.6.1 Influence of Gender on the Performance of Children with MD distribution

In this section the teacher was to indicate whether the child experiencing mathematics difficulties was a boy or girl. Table 4.24 presents the findings of the study

4.6.2 Gender of the pupils

Table 4.24: Pupils' Gender

School Type	Responses	Frequency	Percentage
Private (X)	Male	23	28.75
	Female	17	22.25
TOTALS		**40**	**50.00**
Public (Y)	Male	22	27.50
	Female	18	22.50
TOTALS		**40**	**50.00**
Overall Totals		80	100.00

Table 4.24 indicates that there were more boys (45) experiencing mathematics difficulties compared to girls' (35) in the primary schools under the study. This study seemed to agree with the findings of a study by Giku (2010). This study was conducted in Thika district with the purpose of determining the status of dyslexia among pupils in public primary schools and its implications for learning. The sample was 14 schools; 3406 pupils were studied among them 1787 boys and 1699 girls respectively. 348 boys and 212 girls were dyslexic. This constituted 19% and 12% respectively. This means more boys had dyslexia compared to the girls. There is need for a study to be done to establish why this is the case.

Table 4.25: Gender Influence on Mathematics Performance of Children With MD

	Sex	N	Mean	Std. Deviation	Std. Error Mean
POST TEST	Male	22	47.2353	21.33521	5.17455
	Female	17	59.0909	22.12284	4.71660
PRE TEST	Male	22	44.3529	23.19736	5.62619
	Female	17	60.5455	18.46677	3.93713

Table 4.25 shows that boys improved in their mean score from (44 – 47%) in the pre test and post test respectively. On the other hand, there was a slight drop among girls from (60-59%) in the pre-test and post tests. Nonetheless, the changes did not bring about a significant difference in performance between boys and girls with mathematics difficulties who received remedial teaching in the post test results while a significant difference is observed during the pretest examinations. This is further represented in the figure below;

Figure 4.4: Gender Influence on Mathematics Performance of Children with MD

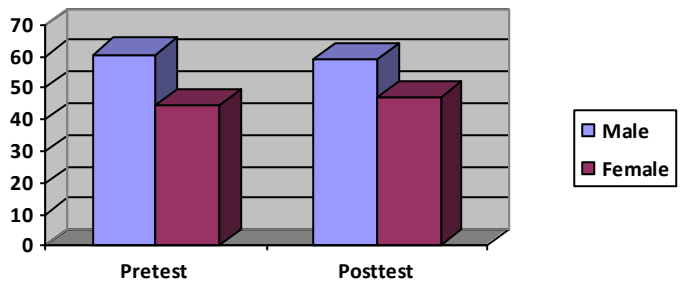


Figure 4.4 indicates that there is no significant difference in performance between boys and girls with mathematics difficulties who received remedial teaching in the post test results while a significant difference is observed during the pretest examinations. Further statistical tests were done to establish the relationship between the performance of children with MD who received remedial teaching and those who did not was tested for significance using the t test. To this end, the following hypothesis was formulated *H3: There is no significant difference in performance between boys and girls with mathematics difficulties who receive remedial teaching.*

Table 4.26: Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
POSTTEST	Equal variances assumed	.175	.678	-1.7	37	.100	-11.8556	7.03508	-26.1	2.4
	Equal variances not assumed			-1.7	35.2	.099	-11.8556	7.00159	-26.1	2.4
PRETEST	Equal variances assumed	1.459	.235	-2.4	37	.020	-16.1925	6.66699	-29.7	-2.7
	Equal variances not assumed			-2.4	30.0	.025	-16.1925	6.86695	-30.2	-2.2

Table 4.26 reveals that the (t=0.69, df= 35 at a P< 0.99) is more than a P value of 0.005. The higher P value indicates that the difference was significant during the pre test but an insignificant difference in the post test (t=1.69, df= 37 at P value <0.001). This led to the null hypothesis being accepted. Therefore, the performance of girls and boys with MD who received Remedial Teaching had no

significant difference. This implied that gender did not influence performance of pupils with MD who received Remedial Teaching.

These findings however, seemed to contradict other researches which indicated that gender influenced student's academic achievement. For in instance, research studies by KNEC (2010) have found out that there is a significant difference in male and female achievement in numeracy in western province in favor of boys. In science, a meta-analysis of 77 studies was conducted between1980-1995 among middle high school students in the U.S and established that (Dowker, 2004) that science favored male performance. In another study by Hedges and Neuman (1993) it was found out that boys outperform girls in sciences.

Also, an analysis of data from National Educational Longitudinal Study (NELS: vol. 8) as cited by Soyinka (1999) established a large advantage of males in physical science subtest than the modest advantage for females. Data from National Assessment of Educational Progress (NAEP) for grade 7 and 11 students established that more male students were more likely to have reported having attempted to fix electrical/mechanical devices than females. Nonetheless, some studies have indicated that girls perform better than boys in major functions. Girls graduate from high school with higher point averages than their male counterparts.

Another study in Nigeria indicates that there is a significant difference between the Mathematics achievement of the rural male and female students. This is

because the calculated *t* value of 5.43is greater than the critical *t*-value of 1.645 at.05 level of significance and 1998 degrees of freedom. The hypothesis, Ho1 is therefore rejected and the alternative upheld .Interest in gender-achievement relationship among rural students stems from the fact that these students are in the majority in Nigeria as a heavily populated developing nation in Africa. The first finding revealed the existence of significant gender achievement gap in favour of the rural males (tcal 5.43, tcrit 1.645 at .0. 05 level of significance).This corroborates popular research findings in gender literature (Ezeameyi 2002; Asimeng–Boahene 2006). Nurture in Nigeria tends to favour male dominance over the feminine gender. Environmental provision for male students makes them fit and able to cope with tasks requiring high intellectual challenge, computation and rigor. This phenomenon is further compounded in Africa where sex-stereotyping is so pervasive that from birth, society fixes gender roles and conditions males to play and act within the confines of intellectually and physically more challenging tasks like construction, moulding, football, palm-wine tapping, climbing, agriculture, fishing and the like. Women on the other hand, are 'sentenced' to the kitchen and related domestic chores, including child-rearing. By extension, female students in the school tend to opt for subjects like, Home Economics and at most Biology. Chemistry, Physics, Mathematics and Further Mathematics are male-dominated zones (Graham, 2001). In school, one hears female students saying that further Mathematics is for the boys and this low motivation may further widen the gender gap in mathematics achievement (Mutemeri & Mygweni, 2005). In fact, a typical informal survey in the Nigerian

classroom will readily show a greater proportion of female students opting for non-Mathematical subjects if given the opportunity. This may explain why Mathematics is made compulsory in both primary and secondary schools. Yet, to date many students still take the subject not by conviction of its significance but on the basis of the compulsion. This being a study done in primary schools as the mathematics one may explain why there was no significant difference in boys' and girls' performance in mathematics performance in the intervention programme. There is need also to find out why girls do well in mathematics and sciences when in high school than when in primary school.

4.6.3 Influence of Type of school on Remedial Teaching

An equal number of pupils was selected from the public and private primary school and grouped into control and experimental groups. A pre and post test exam was administered to establish the influence of the type of school on effect of remedial teaching for pupils with MD. Table 4.27 presents the findings of the type of school the teachers taught.

Table 4.27: Impact of Remedial According to the Type of School

Group Statistics

	Type of school	N	Mean	Std. Deviation	Std. Error Mean
POSTTEST	Public	19	47.9474	13.96215	3.20314
	Private	20	59.6000	27.21919	6.08640
PRETEST	Public	19	49.8947	15.89512	3.64659
	Private	20	56.9000	26.41750	5.90713

Table 4.27 reveals that there was a slight drop in the mean of the pupils with MD in the public schools from 49.894 (in pre test) to 47.947 (in post test) and a slight improvement in mathematics performance of pupils with MD in the private schools from 56.900 to 59. 600. The Std deviation of the public schools dropped from 15.895 in pre test to 13.962 in post test and 26.417 to 27.219 in post test. The slight changes in the performance of the two groups indicated there was no significant difference in mathematics performance between pupils with mathematics difficulties in public and private primary schools who were in the experimental group (who receive remedial teaching). The lack of significant difference is observed in both pretest and post test results. Therefore hypothesis 2 is accepted as indicated in Figure 4.5 below;

Figure 4.5: Impact of Remedial According to the Type of School

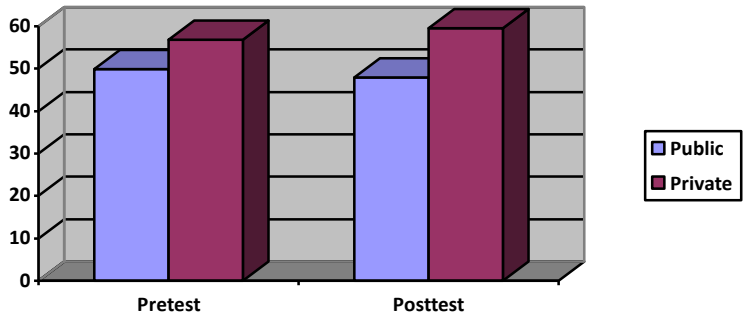


Figure 4.5 indicates that there was a slight improvement in the mathematics performance of pupils with MD in private schools in the pre test and post tests (56-59%) while there was a slight drop in the mathematics score of pupils with MD in public schools in the pre test and post tests from 49-47%).The slight improvement and drop in the performance of learners in private and public

schools was not significant in bringing about differences in mathematics performance between pupils with mathematics difficulties in public and private primary schools who were in the experimental group (who receive remedial teaching). The lack of significant difference is observed in both. Further statistical tests were done to establish the relationship between the performance of children with MD who received remedial teaching and those who did not tested using the *t* test. To this end, the following hypothesis was formulated *H2: There is no significant difference in mathematics performance between pupils with mathematics difficulties in public and private primary schools who receive remedial teaching.*

Table 4.28: Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
POSTTEST	Equal variances assumed	24.847	.000	-1.7	37	.104	-11.7	6.98	-25.8	2.49
	Equal variances not assumed			-1.7	28.7	.101	-11.7	6.87	-25.7	2.42
PRETEST	Equal variances assumed	12.862	.001	-.99	37	.325	-7.0	7.03	-21.2	7.23
	Equal variances not assumed			-1.01	31.4	.321	-7.0	6.94	-21.16	7.14

Table 4.28 postulates that the (t=0.98, df=37 at P value of < 0.325) is less than P value of 0.005 to be significant. In the post test (t = 1.67,df= 37 at a P value <0.-104) was equally less than P value of 0.005 for the null hypothesis to be rejected.

Hence we accept the null hypothesis meaning there is no significant difference in mathematics performance of children with MD who receive remedial teaching in public and private schools. In this study therefore, the type of school did not influence performance in mathematics of pupils with MD after intervention. This means that intervention can help the performance of all children.

The findings of this study contradicted those conducted by Gathara Mugo (2012) to establish the factors that influence KCPE performance: Comparative study of the public and private schools in central division, Kirinyaga district. A sample of ten public and ten private primary schools was selected. For public schools, random sampling was used while purposive sampling was used for private schools. The study found out that there was a significant difference in KCPE performance between public and private primary schools in Central division. There are differences in the roles played by parents in both types of schools. The parents are the main suppliers of textbooks and writing materials. There was a difference in the professional support provided to schools in favor of public primary schools. In the school environments, there was a significant difference in teacher and pupils expectations, availability of physical facilities and problems experienced by each. The study recommended sharing of facilities between schools and provision of professional support to all types of schools. In-service courses should be encouraged to all teachers and parental participations should be encouraged in all schools.

Also, Ochenje Catherine (2008) did a Comparative Study of Factors Influencing Academic Performance between Private and Public Primary Schools In Kitale Municipality in Kenya. The main focus of this study was class 4 pupils who were admitted in class in the year 2003 when Free Primary Education (FPE) programme was implemented. The purpose of this study was to compare factors influencing the academic performance of public and private primary school pupils in class 4 in Kitale Municipality. The tests of significance showed disparity in academic performance both boys and girls in private schools from those of the public. Thus private schools do better than public schools even at lower levels. There is need for education and policy assurance officers to step up inspection to enhance effective teaching among public primary school teachers. The government needs to step up financial and material support to public schools to cater for high enrolment due to FPE program. It is hoped that educational stakeholders including teachers, parents, policy makers and students will benefit from the study.

CHAPTER FIVE

SUMMARY, CONCLUSIONS, RECOMMENDATIONS AND SUGGESTIONS FOR FURTHER STUDIES

5.1 Introduction

This chapter presents a summary of the study findings, conclusions and recommendations of the study. The main objectives of this study were to establish if there was early identification of MD, common forms of MD and remedial teaching plus its impact to mathematics performance of children with MD. The chapter also presents suggestions for further studies.

5.2 Summary Findings of the Study

There was early identification of children with Mathematics Difficulties (MD). More boys experienced MD in both public and private schools than girls. Sixty eight (68) out three hundred boys (300) in the study had MD. This constituted 22.5% of the total number of boys. There were sixty six (66) girls out of three hundred and fifty four having MD. This formed 18.5% of the entire girls' population in the study. The average population of learners with MD was 20.5%. There were more pupils with MD in the public schools than in the private ones. The findings of this study were closely related to Uwezo (2010) which revealed that about 22% of pupils in Kenyan primary schools had numeracy problems.

The most common forms of MD identified were; addition and subtraction with carrying over plus other general mathematics difficulties. Teachers used direct

observation, followed parents' concerns and used elimination of the possible major forms of SNE like Visual, Hearing, Physical and Mental Impairment (differential diagnosis).Effective identification of MD may have been affected by some factors such as; Teachers' experience and professional qualifications because most teachers attained training to certificate and taught for less than five years. Reviewed literature indicated that teachers with high professional qualifications such a degree or even a masters and long years of service equipped them with necessary pedagogical skills to offer effective Remedial Teaching.

All the teachers who participated in the study indicated that they conducted remedial teaching for pupils with MD. The most common forms of tuition done was paid tuition, multi sensory approach and use of ability groupings. Most teachers conducted the study in the evenings after formal classes. The effectiveness of this programme was influenced by the high teacher pupil ratio. Secondly, parents' educational level and SES influenced children's performance in mathematics. Relevant studies reviewed indicated that literate parents and those from good SES were more involved in their children's education by helping them do their homework than illiterate and poor ones who spend much time looking for food. This close interaction enabled them to easily identify children's areas of difficulty and raise their concerns with the teachers for follow up and even arrange for remediation. The findings of this study revealed that most parents did not also have high academic qualifications leading to most being peasant farmers and in the informal employment.

In this study, it was established that most children came from very large families ranging from 1-10 children although they were among the first three born. However, there were no schemes, lesson plans or Individualized Education Plans (IEPs) kept for these tuition programs apart from attendance registers and payment lists. All in all, these tuition programs were actually not driven by the need to help children with MD but to cover essential subjects for merely examination success.

Pupils with MD who received Remedial Teaching (the Experimental group) performed better than those who did not receive Remedial Teaching (the Control group). The mean of the children who received Remedial Teaching improved (53.5 -53.9). However, the influence of the type of school and gender on the mathematics performance of pupils with MD was not significant and could affect performance in mathematics for pupils with MD.

5.3 Conclusions

The teachers in both public and private primary schools identified pupils with Mathematics Difficulties. The most common MD experienced was addition with carrying over and borrowing in subtraction. There was remedial teaching for pupils identified with MD; whereby the most common programme used was private paid tuition. There was also a difference in mathematics performance between pupils who received Remedial Teaching (Experimental group) and those who did not receive (Control group). This means that the remedial teaching programme improved the mathematics performance of pupils with MD. However,

the influence of gender and type of school was not significant and hence did not affect how children with MD performed in mathematics.

5.4 Recommendations

Enhancing Early Identification and Intervention of pupils with Mathematics Difficulties should involve several stakeholders in education. Some of the recommendations are:

(i) The Ministry of Education Science and Technology (MOEST) should formulate a policy that supports early identification and intervention of MD in all regular schools.

(ii) Kenya Institute of Curriculum Development (KICD) should develop a standardized tool promote early identification and intervention of MD in regular schools. Kenya Institute of Curriculum Development (KICD) should also develop an appropriate remedial teaching program for effective early intervention of MD in regular schools.

(iii) Teachers Service Commission (TSC) should lower the high teacher pupil ratio by hiring more teachers ensure that there is no overcrowding in classes impeding effective teacher pupil interaction appropriate for effective early identification of MD.

(iv) Teacher Training Colleges (TTCs) or Universities should equip teacher-trainees with relevant pedagogical skills and knowledge to identify mathematics difficulties and offer effective early intervention of mathematics difficulties.

(v) Universities should play a leading role not only doing research on SNE but also develop remedial teaching programmes and provide in-service training to teachers to equip them with the necessary pedagogical skills for effective early intervention of MD.

5.5 Suggestions for further Studies

A national survey of primary schools should be done to provide information on identified cases of MD. This study should be replicated in other districts and counties with similar characteristics for comparisons. A study should be conducted to establish the gender distribution of pupils with MD. The attitude of pupils with MD towards mathematics should be studied to find out how it influenced their performance. Factors influencing remedial teaching and effective intervention of MD should be studied also. Empirical studies should also be conducted to establish how SES, ordinal position and parents' literacy influenced early intervention of MD.

REFERENCES

Abiam, P. O. & Odok, J. K. (2006).Factors in Students' achievement in different branches of secondary school Mathematics. *Journal of Education and Technology.*1(1), 161 – 168.

Abiodun R, F., A 1997. The Challenges of Mathematics in Nigeria's Economic Vision 2010. A Keynote AddressDelivered at the 34th Annual National Conference of the Mathematical Association of Nigeria,Sept, 1-6, 1997.

Adams, M. J. (1995). Resolving the 'great' debate. *American Educator,* 19(2); 1-20.

Aguele L.,I (1996). Difficulties Facing the Teaching and Learning of Mathematics in Nigeria: Implications for Teachers. In: JO Enaohwo, JN Umeoduagu (Eds.).Science, Technology and Mathematics (STM Education in Contemporary Nigeria. Agbor:m Kmensuo Educational Publishers, pp. 175-181.

Aguele L.,I (2004). Remediation of Process Errors Committed by Senior Secondary School Students in Sequences and Series. Ph.D. Thesis, Unpublished. Nsukka: University of Nigeria.

Aguele, M., L., Ojugo, M.O. and Osafehinti I.,O.,E (1990). The Universality of Mathematics. ABACUS, 20 (1): 47-56.

Alley, G.R & Deshler,D.D (1979). Teaching the Learning Disabled Adolescents Strategies and methods. Denver, Love p13.

Amateshe, S. M (2011). Speech Development and International Techniques in children with Down Syndrome and Cerebral Palsy: A case of Maria Magdalena School, Thika. A Kenyatta University unpublished Master's Thesis.

Arasa, A, N. (2004). Cognitive Correlates of English Reading Achievement among Std.3 pupils in the slums of Nairobi. Unpublished PhD Thesis Kenyatta University.

Asim, A. E. (2007). Examination ethics and school based assessments in science, technology and mathematics: A**60** *Proceedings of epiSTEME 3*critical concern for universal basic education. *Proceedings of the 9th National Conference of National Association of Evaluators and Researchers*. Nigeria, Ago-Iuoye.

Asim, A. E., Kalu, I. M., Idaka, I. E., & Bassey, S. W.(2007). Competency in STM assessment: The case of primary school teachers in Cross River State, Nigeria. *Proceedings of International Conference to* Review *Research in Science, Technology and Mathematics Education* (epiSTEME-2), Feb. 12-15, Mumbai, India.

Asimeng – Boahene, L. (2006). Gender inequality in science and mathematics education in Africa: The causes,consequences and solution. Unpublished Seminar paper. Barton, A. C. (1998). *Feminist Science Education*. NewYork: Teachers College Press.

Bambico, T (2001). Influence of Teachers 'Personal Variables to Teachers Mathematics Instruction skills. Journal of International development and cooperation .Vol 8 No. 1 2001 pp 161 – 178.

Barman, C.R, Allard D.W (1993). The Learning Cycle and College Science Teaching. Paper Presented at the Annual International Conference of the National Institute for Staff and Organizational Development on Teaching Excellence and Conference of Administrators at 15th, Austin, TX. May 2-29, 1993.

Bateman, B. & Linder, M (1998). Better IEPS. Longmont, Co: Sopnis west.

Becker,G., S (1981). Treatise on the Family Cambridge Mass. Harvard University press, Cambridge.

Behrad, B (2006). Prevalence of learning disabilities in Iranian primary students a Meta analysisjournal of research on Exceptional children. 4, 417-436.

Behraman, J., R (1986). Birth Order, Schooling and learning. J Labor Econ, 4:121-145.

Best, J W (1992). Research in education. New Jersey, Prantice- Hall.

Bley, N. Thorton, C. (2001) *Teaching Mathematics to Students with Learning Disabilities.* Austin, Tx; Pro-ed.

Borg R. Ward M.D. Gall (1989). *Educational Research*; an Introduction, New York: Longman Inc.

Bray, M (2003). Adverse effects of private tuition supplementary Tutoring: Dimension, Implications and Government Responses. Paris IIEP – UNESCO.

Brignull, H (1999). Why is Mathematics Hard to Teach An Extended Essay <- http: //www.neocortex.co.uk/essays/edu/edu-mathe.htm>. (Retrieved October12,2003).

Bryant, B.R., Bryant, D.P, Kethley, C., Kim, S.A., Pool, C., Seo, Y. (2008). Preventing mathematics difficulties in the primary grades: the critical features of instruction in textbooks as part of the equation. Learning disability quarterly, 31, 21-35.

Buhari, V.A (1994). Planning Factors that Influence Students' Performance in Mathematics M.Ed Dissertation, Unpublished. Ibadan: University of Ibadan.

Burtler, F. Miller (2003). Learning Disabilities Research and Practice Assistance to States for the education. Fraction Instruction for Students with Mathematics Disabilities. 18(2)91-14.

Butterworth, B (2005b). Developmental dyscalculia In D Campbell (ed). Handbook of mathematics cognition. New York : Psychology Press.

Campbell, D. T (1957). Factors relevant to the validity (2003). *Effects of Manipulative Instruction*; Learning Disabilities research & practice, 18(2), 112-120.

Carnine, D., Jitendra, A., & Silbert, J. (1997). A descriptive analysis of mathematics curricular materials from a pedagogical perspective. Remedial and Special Education, 18 66-81.

Carnine, D.W & Stein, M (1981). Organizational Strategies and practice procedures for teaching basic facts. Journal for Research in mathematics Education, 12, 65-69.

Cass, M, Cates, D; Smith, M. Jackson (2003). *Effects of Manipulative Instruction*; Learning Disabilities research & practice, 18(2), 112-120.

Chad, G. (2007). Vygotsky's Construction MA: MIT press.

Chadha, A, (2001). *A Guide to Educating Children with Learning Disabilities*. Vikas publishing house; PVT Ltd.

Chadha, A. (1999). *A Handbook for Primary School Teachers of Children with Learning Disabilities,* Educational consultant of India Limited, New Delhi, India. Sona Printer pvt. Limited, New Delhi India.

Cockroft Committee of Inquiry (CCMI) (1982). Mathematics Counts, London.

Cohen Kodosh, R , Cohen Kadosh, K Schuhman, T , Kaas, A Goebel, R, Hink, A (2007). Virtual Dyscalculia after TMS to the right parietal Lobe :A combined FMRI and neuro navigated TSM study. Current Biology, 17, 689-693.

Coleman, J., Campbell, E., McFarland, J., Mood, A. Weinfield, F., York, R (1969). Equality of educational opportunity. Washington D.C : US Government printing office.

Cook, N,L, Heron, T.E & Heward, W.L (1983). Peer Tutoring :Implementing class wide programmes in the primary grades. Colombus, OH : Special Press.

Coolican, H. (1996). *Introduction to Research Methods and Statistics in Psychology* (2 ed) Abingding: Hodder and Stoughton.

Copple, C. (1991). *Quality Matters. Improving the professional Development of the Early Childhood Workforce*. Washington D.C. National Association for the Education of theYoung Children.

Darling-Hammond, D (2000). Teacher quality and student Achievement. A review of state policy evidence: Educational Policy Analysis Archives, 8 (1) Retrieved may 2, 2002 from http//olam.ed.asu.edu.

De Vaus, A. D (2008). Research Design in social Research. Cromwell press LTD. Trowbridge, wills Great Britain.

Deborah, J (2001). Pioneers in our field Scholastic Early Childhood today.

Desoete, A. (2007). Students with mathematical disabilities in Belgium: from definition, classification and assessment to STICORDI devices. In T.E. Scruggs & M.A. Mastropieri (Eds.), Advances in Learning and Behavioral Disabilities. (pp. 181-222). Amsterdam & Oxford: Elsevier Press.

Din FS (1998). Direct Instruction in Remedial Mathematics Instruction. Paper presented at the National. Conference on Creating the High Quality School; Arlington, VA.March 25-28. 1998.

Dowker, A. (2004). What works for children with mathematical difficulties? Research Report No 554. Nottingham: Department for Education and Skills.

Dowker, A. (2005). Individual differences in arithmetic. Implications for psychology, neuroscience and education. Hove, UK: Psychology Press.

Dowker, A.D (1998). Individual differences in normal arithmetic development. In C Donlan (ed). The development of mathematical skiils. (275-302).Hove Taylor & Francis.

Dumont, J.J. (1994). Leerstoornissen. Deel 1: theories en model [learning disabilities. Part1: theory and model].Rotterdam: Lemniscaat. 11.

Dyer, C (2003). Teachers Educational and Social Inclusion in India. The role of the Teacher Educators. Enabling education issues 7th, April: Manchester University.

Eccles, J (1987). Gender roles and women's achievement related decisions. Psychology of women quality, 11,135-172.

Eccles, J. S. (1983). Expectancies,Values academic behaviors. Freeman. San Francisco Carlifornia.

Englert, C. S (1984). Effective direct instruction practiced in special education settings. Remedial and special education, 5 (2) 38-47.

Ezeameyi, M. N. (2002). The effects of games on Mathematics achievement, interest and retention of junior secondary school students. Unpublished PhD Thesis. Universityof Nigeria, Nsukka.

Fan, X (2001). Statistical Significance and effect size in education research. Two sides of a coin. The Journal of educational research (Washington D.C, 94 (5) 275_282.

Fletcher, J. (2004). *Issues in Definition and Measurement of Learning Disabilities*. Baltimore Paul H. Brookes.

Fuchs, L.S & Fuchs, D (2002). Mathematical problem solving profiles of students with mathematics disabilities and without Cormobid reading disabilities. Journal of learning disabilities, 35, 563-573.

Gardner, H. (1999). *Intelligence reformed, multiple intelligences for twenty first century.* New York: Basic Books.

Garnett, K.D (1998). Mathematics Learning Disabilities Division for Learning Disabilities. Journal of CEC.

Gathara, P. M (2012). Factors Influencing KCPE Performance :Comparative study of Public and Private schools in Central Division, Kirinyaga District, Kenya. Unpublished MEd Thesis Kenyatta University.

Gearheart, R. C. (1985). Learning Disabilities Educational Strategies, Missouri Times Mirror Mosby Coolege Publishing, U.S.A.

Geary, D. C (2004). Mathematics and Learning Disabilities. Journal Learning Disabilities 37, 4-15.

Geary, D.C (2000). From Infancy to Adulthood: The development of numerical abilities. European child and adolescent psychiatry, 9, 1111-1116.

Giku, F., W (2010). Status of Dyslexia Among Pupils In Public primary schools. A Case of Thika District, Kiambu County, Kenya. Kenyatta University Unpublished Thesis.

Gindis, B (1999). Vygotsky's Vision. Reshaping the practice of special education for the twenty first century.

Ginsburg, H.P. (1997). Mathematics learning disabilities: a view from developmental psychology. Journal of learning disabilities, 30, 20-33.

Gophick, A. Meltzoff (1999). *The Scientist In the Crib*: Minds, Brains and how Children Learn. New York; William Morrow.

Graham, B. (1973). Parent teacher partnership. London: Evans Brothers LTD.

Graham, M. (2001). Increasing participation of female students in physical science class. Unpublished Master's Thesis. Chicago: Saint Xavier University.

Griffin, S. & Case, R (1997). Wrapping up. Using peer communication to enhance models of mathematics teaching and Learning .Issues in education ,3, 115- 134.

Gross- Tsur, V, Manor, O. & Shalev, R, S (1996). Developmental dyscalculia :Prevalence and demographic features.Develpomental medicine and child neurology, 38, 25-33.

Hanich, L.B, Jordan, N.C, Kaplan, D & Dick, J (2001). Performance across different areas of mathematical cognition in children with difficulties. Journal of educational psychology, 93, 615-619.

Hannell, G. (2005). Dyscalculia Action Plans for Successful-Learning in Mathematics. P28 London: David Ralton Publishers Ltd.

Hanson, K (1992). Teaching Mathematics effectively and equitability to females. Trends and Issues NO. 17 New York Colombia University teachers college. (Eric document Reproduction service NO ED 348-465).

Harbor-Peters V.F, A (2001). Unmasking Some Aversive Aspects of School Mathematics and Strategies for averting them. An Inaugural Lecture. Nsukka: University of Nigeria.

Harbor-Peters V.F, A, Ugwu P.N (1995). Process Errors Committed by Students in Some Geometric Theories. Nigeria Research in Education, 7: 141-152.

Hassler, M. (2008). Making Intervention in Numeracy more effective in schools. In A Dawker (ed) Mathematics Difficulties. Psychological Intervention. London.

Hauser, R., & Warren, J., (1997). Socioeconomic indexes for occupations. A review, update and critique. In A E Raftery (ed) Sociological methodology. Cambridge, MA Basil Blackwell.

Hauser, R., S & Sewell, W., H. (1985). Birth Order and Educational Attainment in full siblings. Am Educ Res. J., 32: 1-23.

Hill, M., & O'Nell, J. (1994). Family Endowment and the Achievement of young children with special Reference to the under classs. Journal of Human Resources, 29 1065- 1100.

Howley, C. (2002). Research about Mathematics achievement in rural circumstance. Working paper, No. 4. Athens:Ohio University, Appalachian Collaborative Centre for the study of learning, assessment and instruction in Mathematics.

Hyde, J. S., Fennema, E., & Lamon, S. J. (1990). Gender differences in mathematics performance. A meta-analysis.*Psychological Bulletin*, 107, 139 – 155.

Ifamuyiwa S, Aguele, L. 1999. Problems Facing Mathematics Teaching and Learning in Nigeria. Nigeria Journal of Curriculum Studies , 6(1): 51-55.

Individuals with Disabilities Education Act (IDEAL) of 2004, Public Law 108 – 446, 108th Congress 1st Session (December 3).

Isineyi, M., M (1990) . Common Errors Committed by Junior Secondary School Students in Solving Problemsinvolving Inequalities M.Ed Thesis, Unpublished. Nsukka: University of Nigeria.

Jekins, J & Jekins L (1981). Cross age and peer tutoring: Help for children with learning problems. Reston, VA: The council for exceptional children.

Jekins, J & Jekins L (1998). Peer tutoring in elementary and secondary program. In E, L Myen, G. A Vergason & R. J Whelan, (eds). Effective insructional strategies for exceptional children (pp 335-354).Denver, Co :Love.

JKF (2003). *Primary Mathematics for Standard Three (New edition) Pupils book.* JomoKenyatta Founation, Nairobi, Kenya.

Jones, R. I (1986). *Altitudes And Attitude Change in Special Education Theory and Practice.* Virginia: Eric clearing House on Handicapped and Gifted Children.

Jordan, N, C (2010). Early Predictors of mathematics Achievement and mathematics learning difficulties. University of Delaware, USA.

K.I.S.E (2002). *Education of Children with Specific Learning Difficulties.* Distance learning module 6. Nairobi, Kenya.

K.I.S.E (2007). *Brochure of K.I.S.E Programmes and Services*. Nairobi, Kenya.

Kamonya, C, K (2008). Factors that Hinder teaching learning activities for HI students at Karen Technical Training Institute for the Deaf in Nairobi Kenya. Un published masters Thesis Kenyatta University.

Karibasappa, C.N, Surendranath, P, Prakash, P (2008). Asia Pacific Disability Rehabilitation Journal; vol 19: No 2 pp 76-90.

Kee, H.,& Booth, A., L (2006). Birth Order Matters: The Effects of family size and Birth order on Educations centre for Economics policy Research, Washington DC.

Keogh, B. K. (2000). *A shared Attribute Model of Learning Disabilities*. Journal of Learning Disabilities 26:282-294.

Khakasa, N. W (2012). Factors Influencing secondary school teachers attitude towards G&C program : A Case of Kakamega North District Kenya. Unpublished MEd Thesis Masinde Muliro University of Science and Technology (MMUST).

Kibere, N. K (2005). Private Supplementary Tutoring : Process and Implication in Muthambi Division, Meru South District. Unpublished MEd Thesis Kenyatta University.

KIE (2010). Primary education syllabus volume two. Kenya Institute of Education, Nairobi Kenya.

Kinyua, J, N. (2007). Promoting Parent- Teacher Collaboration in providing Education For Learners with LD in primary schools in Kasarani Division, Nairobi , Kenya. Unpublished Masters Thesis Kenyatta University.

Kirk, F. (1962). *Educating Exceptional Children*. Buston, M.A: Houghton Mifflin, 1962, 263.

KNEC (2000). The KCSE, Regulations and Syllabi 2000-2001. KNEC. Nairobi Kenya.

KNEC (2010). National Assesment System for Monitoring Learners Achievement in Kenya (NASMLA). Kalzmat security print LTD, Nairobi, Kenya.

Kosc, L (1974). Developmental dyscalculia. Journal of learning disabilities, 164-177.

Kpangban E, Onwuegbu OC (1995). Principles and Methods of Teaching. 2nd Edition Agbor: Pon Publishers Ltd.

KU (2003). Kenyatta University Abstracts. Thirteenth Post Graduate seminar. Nairobi, Kenya.

Lacovou, M. (2001). Family Composition and Children's educational outcomes. Institute for Social & Economic research Essex University. Colchester co., 3sqUK.

Lavocou, M. (2001). Family Composition and Children's Educational Outcomes. Institute for Social and Economic research . Essex University Colchester co. 359 UK.

Learner, J, Lowenthal, B & Egan, R (2003). Pre school children with Special needs; children at risk and children with disabilities. Baston; Allyn & Bacon.

Chen A Learner, J. W. & (1992). *The Cross cultural nature of learning disabilities*: Learning disabilities research and practice, 8: 147-149.

Learner, J. W. & Chen, A. (1992). *The Cross Cultural Nature of Learning Disabilities*: Learning Disabilities Research and Practice, 8: 147-149.

Learner, J. W. (2006) *Learning Disabilities and Related Disorders.* Characteristics and Teaching Strategies. Houghton Miflin Company Boston New York.

Leder, G. (1984) Sex Differences in attributions for success and failure. Psychological Report,54,57 58.

Levine, M. (2002). *A mind at a time*. New York; Simon Scherster.

Levine, M. (2003). *The myth of laziness.* New York. Simon and Scherster.

Linder, T.W. (1983). *Early childhood special education programme development and administration;* London: Brookes Publishing Company.

Luise, C (1990). Vygotsky and educational implications of social historical psychology. Cambridge University press.

Lyon G. R. (1996). *Learning Disabilities*. In child Psychopathology. E. Marsha and R. Barkleyieds New York: Guiliford Press. Pp 390-434.

Lyon, G. R & Shaywitz, S (2003). Defining Dyslexia, Cormobidity, teachers knowledge of the language and reading . Annals of Dyslexia, 55, 1-14.

Lyon, G. R. (1989). *IQ is Irrelevant to the Definition of Learning Disabilities*. Journal of Learning Disabilities. 22.504-19.

Lyon, G. R. Fletcher. D. (2001). Rethinking Learning Disabilities. www.ppionline.org.

Maccini, P & Gagnon, J. C. (2000). Best practices for teaching mathematics to secondary students with special needs. Focus on exceptional children, 32, 1-22.

Mauritius Government (1994). Use and Abuse of Private Tuition. Port Luise MOE.

Mazzocco M.M., & Myers G.F. (2003). Complexities in identifying and defining mathematics learning disability in the primary school age years Annals of Dyslexia, 53: 218-253.

Mburugu, H. N (2011). The Status of Private Tuition in Public Secondary schools in Miirigamieru West Division, Imenti North District. Unpublished MEd Thesis Kenyatta University.

McGee, C.S, Kauffman,J. M & Nussen, J. (1977). Children as Therapeutic change agents. Reinforcement Intervention Paradigms. Review of education research, 47, 451-477.

Mercer, D. (1991). *Students with learning disabilities*. New York, Merrill Publishing Company, New York, USA.

Mercer, D. (1992). "On children with Disabilities; Program and Pre school Grants for Children With Disabilities Final Rule " 34 C.R.F.300 AND 301.

Miheso, K. M (2002). Factors Affecting Mathematics performance Among secondary school students in Nairobi Province, Kenya. Unpublished MEd Thesis Kenyatta University.

Moats, L. C. (1996). The Missing Foundation in Teacher Education. Knowledge of the Structure of Spoken and Written Language. Annuls of Dyslexia, 44: 81-102.

M.O.E. (2011). Butere district annual statistics.

MOEST(2002). KNEC Report 2000. KCSE Statistics 1996-1998, 1999: Nairobi Kenya.

Montague EJ, Hoffmann JV, Huntsberger JP (1993). Fundamentals of Elementary and Middle School Classroom Instruction Columbus, Ohio: Merrill Publishing Company.

Morris, B. (2002). *The Dyslexic CEO*. Fortune (May 20th, 2002).

Munby, H., Russel, T., & Martin, A.K. (2001). Teachers' knowledge and how it develops. (pp. 877-904). In V. Richardson (Ed.), Handbook of research on teaching. Fourth edition. Washington, D.C.: American Educational Research Association.

Murname, R.J, & Phillips, B.R (1981). Learning by doing, vintage and selection: Three pieces of the puzzle relating teaching experience and teaching performance. Economics of education Review 1 (4) 453-465.

Mutemeri, J., & Mugweni, R. (2005). The extent to which mathematics instructional practices in early childhood educationin Zimbabwe relates to or makes use of children's experiences. *African Journal of Research in Mathematics, Science and Technology Education*, 9(1), 49-54.

Mwangi, W. (1999). Accelerated student enrolment in Kenyan public universities. Unpublished MED thesis, Kenyatta University, Nairobi.

Mwangi, M. Wanjiru (2007). Preschool Teachers use of Oral Instructional Strategies in Teaching English; A study of Kasarani Division, Nairobi; Kenya. Unpublished MED thesis, Kenyatta University.

Mwangi, W (2009). Accelerated Student Enrolment in Kenyan Public Universities. Unpublished MED thesis, Kenyatta University, Nairobi.

National Council of Teachers of Mathematics (NCTM) (2000). Principles and Standards for school mathematics. Reston, V.A Australia.

Neil, C (1997). Intervention Strategies for students with Learning Disabilities. News digest 25 (ND25).

Neuman, S & Roskos, K (1993). Language and Literacy learning in the early years: an Integrated approach. San Diego : Harcourt Brace college publishing company.

Nowacele, E (1990). Instructional behaviour of more and less beginning regular and special education .Exceptional children 57 (140-149).

Nwafor, B. E & Ango, N. C (1988). The relationship of Birth Order and Family size to the development of cognitive styles. Nig. J Basic Applied psycho., 1: 12-13.

Obodo, G. C. (1997). *Principles and practices of mathematics education in Nigeria*. Enugu: General Studies division, Enugu State University of Technology (ESUT).

Ochenje, C. O (2008). A Comparative study of the factors Influencing Academic performance between public and private primary schools in Kitale Municipality, Kenya.

Oduwale A, Odiase, J (1996). STM Education: Developing a Common Approach to Instruction. In: JO Enaohwo, JN Umeoduagu (Eds.): STM Education in Contemporary Nigeria. Agbor: Kmensuo Educational Publishers.

OECD. (2007). PISA 2006. Science competences for tomorrow's world Volume 1: Analysis. Paris: OECD Publications.

Olneck, M. R & Bills, D., B (1979). Family configuration and achievement. Effects of Birth order and family size in a line of brothers soc. Psycho. Q., 42: 135-381.

Onduso, T,M (2010). A comparison of Teachers' and Students attributions regarding mathematics achievement. : A Case study of Senior Koinange. High school ,Kiambu District Kenya. . Unpublished MEd Thesis , Kenyatta University.

Onwuegbu, O., C (1998). Effects of Cognitive Styles, Study Habit and Instructional Strategies on Students Learning Outcomes in Senior Secondary Schools. PhD Thesis, Unpublished. Ibadan: Institute of Education, University of Ibadan.144.

Opolot, C.O (2010). Factors that Hinder opportunities To Learn mathematics in primary schools in Uganda. Makerere University , Kampala Uganda.

Orodho, J. A. (2004). *Techniques of Writing Research Proposals and Reports in Education & Social Science*. Nairobi, Reatra Printers, Nairobi Kenya.

Osafehinti I.,O.E, Aguele, M., L and Ojugo, M.,O (1990). The Universality of Mathematics. ABACUS, 20 (1): 47.

Otto C, Mcmenemy RA (1983). Corrective and Remedial Teaching: Principles and Practice. Boston: Houghton Mifflin Company.

Ouko, O. H (2007).Use of Thematic Approach by pre school teachers in Kasarani Division, Nairobi; Kenya.

Owino, C. O (2009). Factors contributing to poor performance in mathematics at KCPE among std. 8 pupils in primary schools for learners with HI in Nyanza Province, Kenya. Un published masters thesis; Kenyatta University.

Pandey, R. S. & Advani (1985). *Perspectives in Disability and Rehabilitation*. New Delhi, Vikas publishing house, India.

Powell B & Steelman, L.C (1993). The Educational benefits of being spaced out: Siblings density and educational achievement. Sociol. Rev. 58: 367-381.

Prakash, P (2008). A Remedial Teaching programme To help children with mathematics difficulties. Asia Pacific Disability Rehabilitation Journal vol 19. No 2.

Preston, D (1993). Methods of teaching applying cognitive science to promote students learning. New York; McGraw-Hill.

Raffick, F (2004). The Issue of private Tuition. An analysis of the practice in Mauritius and selected south east Asian countries-Springer Netherlands: International Review of Education vol 48;No 6.

Richard, D (2004). Learning and Instruction. New York: McGraw -Hill.

Rivera-Batiz, F. L (1992). Quantitative Literacy and the Likelihood of employment among young adults in the US. The journal of Human Resource , 27, 313-328.

Rosen shine, B & Stevens, R (1986). *Teaching Function* .Wittrock (Ed) Handbook of research on teaching (pp 376 – 393) New York : Macmillan.

Runo, N. M. (2010). Identification of reading disabilities and teacher- oriented challenges in teaching reading to standard five learners in Nyeri and Nairobi districts, Kenya. Published PhD Thesis, Kenyatta University.

Shadish, W. R. (2002). Experimental and Quasi experimental Designs for generalized causal inference. Belmont: Wadsworth cengage learning.

Shalev, R. Manor, O. (1998). *Persistence of Developmental Dyscalculia*: what counts. The Journal of Pediatrics, 133(3), 358 – 362.

Sindelar, P. T. (1990). A comparison of more and less effective special education teachers in elementary level programmes, Teacher education and special education, 13, 9-16.

Sinnes, A. T. (2005). Approaches to gender equity in science education. Two initiatives in sub-Saharan Africanseen through a lens derived from feminist critique of science. Oslo: Unipub. http://www.ils.u10.no/forskninig/palidrgrad/doktorarhandlinger/docs/ AstridSinnes Av handling feminist critque of science. oslo: Unipub.pdf.

Spears, L (1982). The Relationship of Intelligence to birth order in a sample of 5-18 years old children on the island of Pueto Rico Msc. Thesis The University of Comecticut.

Stauffer, S. A. (1950). Some Observations on study designs. American journal of sociology, 55, 355-361.

Subrotik, R. F (1998). The Motivation to Experiment. A Study of Gifted Adolescents attitudes towards scientific research .Journal of Education of the Gifted 11, 19-35.

Syinka, W. (1999). University system in Nigeria. University of Tempere press, Tempere.

Teniabaje, D. J. (2002). A Comparative study of Intelligence of first borns and Later borns on some achievement tests. Nig. J Counsell. Applied psycho. 1: 82-88.

Tenibiaje, D., J. (2009).Influence of Family and Birth Order on Academic Performance of Adolescents in Higher Institutions. Pakistan Journal of Social Sciences Vol.6 Issue: 3 page 110-114.

Thorton, C., A, Tucker, B. F, Dossey, J.D & Bazik, E.F (1983). Teaching Mathematics to Children with Special Needs Menlo Park, CA: Addison Wesley.

Turge, T. (1990). Vygotsky, the zone of proximal development and peer collaboration. Cambridge University press.

Uba, A (1989). Theories of Counseling and Psychotherapy. Patrice Continental press, Ibadan.

UNESCO (2003). Gender and education for all: the leap for equality. Global monitoring report 2003/2004. http://www.unesco/oc.unesco.org/education/eta-report/2003-pdf/chapter3.pdf.

UNESCO, (2011). Better Life, Better Future "UNESCO Global Partnership for Girls' and Women' Education.

UNICEF, (2001). The State of the World's Children. New York: Unicef.

Usman KO, Harbor-Peters VFA (1998). Process Errors Committed by Senior Secondary Students in Mathematics. Journal of Science, Technology and Mathematics Education, 1(1): 34-3.

Uwezo (2010). Are Our Children Learning? Annual Learning Assessment Report, Nairobi, Kenya.

Van de Walle, J. A. (2004). *Elementary and Middle School Mathematics*; Teaching Development. Boston; Allyn and Bacon.

Van Ejick, K.& De Graaf P. M (1995). The Effects of family structure on the educational attainment of siblings in Europe. Sociol. Rev., 11: 273-292.

Vygotsky L. S. (1978). *Mind in Society*, Cambridge MA. MIT press.

Vygotsky, L. S (1962). Thought and Speech. Mit.

Wafula, R. W. (2009). Early Identification of Learning Disabilities amongst Class Three Pupils of Public Primary Schools of Butere District, Kenya. Unpublished Masters Thesis Kenyatta University.

Wanyama I. & Njeru, E. (2004). The Sociology of Private Tuition. Nairobi: IPAR.

Weinberge, N. (1978). Examination of Pre-school Attitudes Towards the Physically Handicapped. Rehabilitation and Counseling Bulletin.

West, J. K, Denton & Germino-Harsken, E. (2003). America's kindergarteners (NCES 2000 – 070). Washington D.C; National centre for statistics, U.S. Department of Education.

William, S., P (2008). Independent Review of Mathematics Teaching in Early Years settings and Primary school. London Department for Children, Schools and Families.

Wilson, A. & Dehaene, S.(2007). Number Sense and Developmental Dyscalculia. In D Koch, F, Fisher and D, Dawson (eds). Human Behaviour Learning and the Developing Brain. New York, NY Guilford Press.

Wolery, M., Bailey, D. J. (2003). *Early childhood special education research.* Journal of early intervention 25 (2), 88-99.

Wood, F. (1991). *Neurobehavioral Definition of Dyslexia.* Gray Parkton, New York Press, 1991 pp 1-26.

APPENDIX 1

QUESTIONNAIRE FOR CLASS THREE TEACHERS

The purpose of this study is to establish if there is remedial teaching for learners with mathematics difficulties and the remedial programmes used by teachers to offer early identification and intervention of Mathematics difficulties among class three pupils in both public and private primary schools in Butere district. The information you give will exclusively be confidential and limited to the purpose of this study only.

SECTION A: Background Information

Tick/write the appropriate responses.

1) Name of the school……

2) Type of school Private [ ] Public [ ]

3) Gender Male [ ] Female [ ]

4) What is your highest professional qualification?

- Primary certificate [ ]
- Diploma ECD [ ]
  SNE [ ]
- BED SNE [ ]
  Primary option [ ]
  ECD/EPE [ ]
- MED [ ]
- Any other (Specify)_____

5) For how many years have you taught?.....

   1-5 [ ] 6-10 [ ] 11 – 15[ ] 15 and above [ ]

6) How many children do you have in your class? Boys_____Girls_____

7) How many pupils are repeaters in the present class three Boys_____Girls__

SECTION B: IDENTIFICATION OF CHILDREN WITH MATHEMATICS DIFFICULTIES

(1) Do you identify children with mathematics difficulties in your class?

Yes [ ]

No [ ]

If the answer is yes, write the methods you use to identify them

(i)_____

(ii)_____

(iii)_____

(2) What kind of mathematics difficulties experienced by most learners in your class? _____

(3) How many boys and girls in your class experience mathematics difficulties?

Boys_____

Girls_____

SECTION C: REMEDIAL TEACHING PROGRAM

(1) Do you have a remedial teaching programme for children with mathematics difficulties?

Yes [ ]

No [ ]

If the answer is yes, what type of remedial teaching programme do you use for children with mathematics difficulties?_____

APPENDIX II

BASIC SCREENING TOOL

Please do as requested.

SECTION A: Background Information

Name of school…….

Name of pupil……

Type of school……..

Gender of pupil……

SECTION B: PRE- OPERATIONAL SKILLS

Has 9 types of questions tailored to measures pre-operational skills. Items are assigned in increasing difficulty order.

Section 1 : Arrange from the smallest to the biggest/ascending order

867, 475,690, 560, 100, 48, 95, 135, 380, 432

Section 2: Arrange from the biggest to the smallest number/descending order

723, 477, 699, 569, 988,320,223,168,247,360

Section 3 : Mark the biggest number (ascending order first)

100, 500, 749, 628, 998,400

Section 4: Mark the smallest number (arrange in descending order first)

900, 420, 830, 740, 300

Section 5: Write the missing numbers

12, 15, _____, 21, 24…..27…30….33…….

Section 6: Split and write according to place value

101 120 127 137 86

Section 7: Write the place value of the digits in the boxes

Section 8: write these numbers into words

125, 145, 174, 182, 193, 200, 360, 570, 785, 926

Section 9: Write these words to numbers

One hundred and eleven Three hundred and forty Five hundred and twenty two

Seven hundred and thirty five, Eight hundred and sixty six

SECTION C: BASIC MATHEMATICS OPERATIONS

Contains 9 items that measure basic operational skills

Section 1: Addition without carrying over

24 + 31_____ 72 + 53_____ 101 + 80____ 100 + 20 + 3_____

120 + 15 + 6_____

2: Addition with carrying over

142 + 24 =___321 + 42 =___604 + 25=____701 + 84=____861 + 32_____

3: Subtraction

189 – 9 =____379 – 8 =____299 – 7=_____227 – 11=____388 – 17_____

4: Addition and Subtraction

Fill in blanks on addition and subtraction

18 + ☐ = 28 30 - ☐ = 18 15 - ☐ = 10

☐ - 3 = 15 13 - ☐ = 30

5: Multiplication

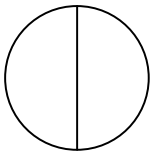
3 x 10=_____ 10 x 3=_____ 9 x 3=_____ 5 x 4_____ 7 x 5_____

6: Division

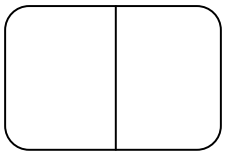
4 ÷ 2 = _____ 20 ÷ 4 = _____ 15 ÷ 5 = _____ 18 ÷ 9 = _____ 16 ÷ 4 = _____

7: Fill in blanks on division and multiplication

8: Representing figures in fractions (halves)



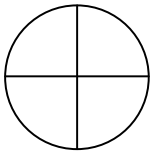
Orange



Bread

Which fraction is this?

9: Representing figures in fractions (quarters)



Orange

Bread

Which fraction is this?

APPENDIX III
A REMEDIAL TEACHING PROGRAMME-SRTM

The SRTM (Samveda Remedial Teaching Model) is used in this study. This programme follows this sequence; the child's performance is observed in a series of tests and classroom behavior to establish the precise area where the student's level of competence in a specific skill breakdown. For good mastery of concepts, complex ones should be broken into simple sub skills and using real life situations to make it easier for learners to acquire complex skills. Children are allowed to master concepts at their own pace, their progress is monitored and teaching adjusted to suit their individual speed.

Secondly, teaching Concrete mathematics is done using concrete objects to make concept formation for children easy. Children are given a chance to manipulate different materials in sorting, grouping and arranging in columns. Children are also taught counting (oral with pictorial representations), number reading and writing. Thirdly, teaching skills like place value and face value, fundamental facts, addition, subtraction, multiplication and division is done by grouping and regrouping concrete materials in a game form. Different place values are matched with specific colors.

Teaching Frame

Lesson 1 – Sequencing numbers.

Lesson 2- Mark the smallest and the biggest numbers.

Lesson 3- Write the number that comes before and after this number.

Lesson 4- Split and write these numbers according to the place value.

Lesson 5- Identify the place value of the marked digit.

Lesson 6- Dictate numbers to be written in words.

Lesson 7- Dictating words to be written in numerals.

Lesson 8- Understanding meaning of addition as putting together.

Lesson 9- To add up single digit numbers.

Lesson 10- To add a two digit number without carrying over.

Lesson 11- To understand subtraction means to take away.

Lesson 12- To understand the subtraction of one digit numbers.

Lesson 13- To learn that learn that subtraction is the reverse of addition.

Lesson 14- To subtract one digit number from a two digit number without borrowing.

Lesson 15- To subtract a two digit number from a two digit number without borrowing.

Lesson 16- To understand that multiplication means to increase.

Lesson 17- To understand the process of multiplication.

Lesson 18- To multiply a one digit number with a two digit number.

Lesson 19- To understand division means to partition or share in to groups.

Lesson 20- To divide a two digit number with a one digit number.

Lesson 21- To understand division as the reverse of multiplication.

Lesson 22- To understand the meaning of a fraction.

Lesson 23- To divide objects into halves.

Lesson 24- To divide objects into quarters.

APPENDIX IV

PARENTS' AUTHORIZATION

Dear parent,

I am a post graduate student in the Department of Early childhood Education undergoing Doctorial studies (PhD) at Kenyatta University. My topic of study is "**Influence of Early Intervention on the mathematics performance of class three pupils with Mathematics Difficulties in Butere District**. This studies is aimed at identifying pupils who are not performing well in mathematics because of experiencing Mathematics Difficulties and thereafter give them a Remedial Teaching programme to enable them perform better in mathematics. I have been authorized by Kenyatta University and the Ministry of Education Science and Technology (MOEST) respectively to do this study.

I am therefore, requesting permission to allow me involve your son/daughter……to be involved in this study. Kindly respond by ticking and returning the coupon attached to this letter with your ACCEPTED or NOT ACCEPTED answer to enable me proceed on

Cut along this line

…….....

Name of Child……

I ACCEPT **( )**

I DO NOT ACCEPT **( ).**

Yours faithfully

Wafula Robert (Researcher).

APPENDIX V: APPROVAL OF RESEARCH PROPOSAL

KENYATTA UNIVERSITY
GRADUATE SCHOOL

E-mail: kubps@yahoo.com
dean-graduate@ku.ac.ke
Website: www.ku.ac.ke

P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 8710901 Ext. 57530

Our Ref: E83/14108/09

Date: 7th May, 2012

The Permanent Secretary,
Ministry of Higher Education, Science & Technology,
P.O. Box 30040,
NAIROBI

Dear Sir/Madam,

RE: RESEARCH AUTHORIZATION
MR. WAFULA ROBERT WEKESA - REG. NO. E83/14108/09

I write to introduce Mr. Wafula Robert Wekesa who is a Postgraduate Student of this University. He is registered for a Ph.D. degree programme in the Department of Early Childhood Studies in the School of Education.

Mr. Wekesa intends to conduct research for a Thesis entitled, "Early Intervention of Mathematics Difficulties in Lower Primary Schools in Butere District, Kakamega County, Kenya".

Any assistance given will be highly appreciated.

Yours faithfully,

MRS. LUCY N. MBAABU
FOR: DEAN, GRADUATE SCHOOL

LNM/cww

APPENDIXVI: RESEARCH AUTHORIZATION

REPUBLIC OF KENYA

MINISTRY OF EDUCATION

Telephone: Butere 020-2634996
When replying please quote Our

Our Ref No:BTR/TSC/380990/48
Your reference: .....

DISTRICT EDUCATION OFFICE
BUTERE DISTRICT
P.O. BOX 295, BUTERE

DATE :18TH MAY, 2012

ROBERT WAFULA

RE : RESEARCH AUTHORIZATION.

Further to Permanent Secretary Ministry of Higher Education, Science and Technology's letter dated 7/5/2012 ref : E83/14108/09.

You are hereby authorized to conduct research for a thesis entitled "Early Intervention of Mathematics Difficulties in Lower Primary School in this District, Kakamega County".

TITUS SEMBEYA
FOR : DISTRICT EDUCATION OFFICER
BUTERE DISTRICT

CC

The Permanent Secretary
Ministry of Higher Education
Science and Technology
P. O. Box 30040
NAIROBI

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