STUDENT FACTORS INFLUENCING NUMBER OF ERRORS IN MATHEMATICS: A SURVEY OF SECONDARY SCHOOLS IN KEIYO NORTH, ELGEYO MARAKWET COUNTY

BY

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DECLARATION

DECLARATION BY THE CANDIDATE

I hereby declare that this thesis is my original work and has not been presented for a Degree in any other university.

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DEDICATION

This research thesis is dedicated to my loving husband Lazarus Chebii and our children; Winnie, Vicky, Edgar, Ronny and Abby for their support and encouragement.

ABSTRACT

In school, there are many students who struggle with mathematics tests. They seem to understand mathematics concepts but when it comes to tests, they often fail almost in every test. They will make mistakes or seem to forget everything they have been taught and studying student factors influencing number of errors in different mathematics fields is one of the research areas that have attracted little attention among many researchers despite it being relevant at the present. The objectives of this study is set to establish the effects of factors predicting students' number of errors in Mathematics: to establish effect of test anxiety on students' number of errors in mathematics; to examine influence of absenteeism on students' number of errors in mathematics; to assess influence of incentives for learning on students' number of errors in mathematics and to determine influence of study habits on students' number of errors in mathematics. Behaviorists learning theory by B. F. Skinner was used to inform the study. The study adopted a descriptive research design. The study aimed at collecting information from students on their perception and opinion in relation to factors that causes errors in mathematics in Keiyo North, Elgeyo Marakwet County. The target population composed of 2369 Form 2 and 3 students' drawn from 21 public secondary schools in Keiyo North, Elgeyo Marakwet County. To select the participants, the simple random sampling technique was used to select 237 Form 2 and 3 students. Data was collected by a student's questionnaire and document analysis. Content validity was determined using expert advice. Crobanch Alpha of .7 was obtained for the reliability index. The Statistical Package for Social Sciences (SPSS) computer programme version 20.0 package was used to analyse the data. Quantitative data collected was analyzed using descriptive statistical techniques which are frequencies, mean, standard deviation. Pearson correlation was used to show the relationships that exist between the variables. Students, teachers and governments will benefit from this study by understanding which studying behaviors are relevant in reducing errors in mathematics. The findings of the study indicated that test anxiety; class absenteeism and study habit have a positive and significant effect on students' number of errors in Mathematics. Incentives for learning were also shown to have a significant relationship on students' number of errors in mathematics. The study found that test anxiety, class absenteeism and bad studying habit induce errors, while Incentives for learning reduces student's number of errors. Students should seek assistance where they experience difficulty so as to reduce test anxiety during tests, which makes them commit errors. It is necessary for students to avoid missing lessons so as to master the concepts in Mathematics and reduce the number of errors. As a result, it is imperative for schools to avail revision text books to students and give rewards to them whenever they exhibit exemplary performance and is utmost necessary for students to do their homework assignments and work the problems before looking at the solutions.

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LIST OF ABREVIATIONS

JICA	Japan International Cooperation Agency
KNEC	Kenya National Examination Council
NACOSTI	National Commission for Science, Technology and innovation
NAEP	National Assessment of Educational Progress
SAT	Scholastic Aptitude Test
SMASSE	Strengthening Mathematics and Sciences in Secondary Education
SRK	Skills, Rules and Knowledge
U.S	United States

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CHAPTER ONE

INTRODUCTION

1.0 Overview

This chapter outlines the background of the study, statement of the problem, objectives of the study, purpose of the study, significance of the study, limitations, scope and operational definition of terms.

1.1 Background to the Study

During exam, some students become careless, working unconscientiously (Baker, Corbett, Roll and Koedinger 2008) and making unintended errors (Craig, Graesser, Sullins & Gholson, 2008). This can happen when an individual is overconfident in carrying out a task (Craig *et al*, 2008), or carries out a task in an impulsive or in a hurried manner. Carelessness errors are a common behavior among students, even among high-performing students (Hershkovitz, Baker, Gobert & Wixonl, 2011). Carelessness errors not only reduce short-term performance, it can even lead to poor overall academic performance among students (Fornells & Olivares, 2000). Clements' (2004) definition of careless errors – errors committed on skills that a student knows (though slips may also occur for other reasons, such as shallow knowledge).

Knowledge of the common mathematical errors and misconceptions of children can provide teachers with an insight into student thinking and a focus for teaching and learning (Williams & Ryan, 2000). A social constructivist view of learning suggests that errors are ripe for classroom consideration; via discussion, justification, persuasion and finally even change of mind, so that it is the student who reorganizes their own conception (Cobb, Yackel & McClain, 2000; Ryan & Williams, 2003; Tsamir & Tirosh, 2003).

According to the Oxford Advance Learners Dictionary, an error implies a mistake, especially one that causes problems or affects the result of something. They inhibit a student to respond or solve a problem correctly (Hornby, 2000). They are also unintentional or careless mistakes as a result of poor judgments or poor value of mathematical quantities, measured values or designs (Encarta, 2004). Many factors may contribute to student's mathematic errors during exam, such as exam anxiety, not paying attention in class, being over confident and not studying as hard as required, excessive absenteeism, lack of incentives for learning, studying only just before the exam and not from the beginning of the term, some students estimate poorly the range of material that would be tested as well as the time needed to prepare well, and so on (Arce-Medina, 2006).

According to Dornyei (2005), differential success is due to individual learner differences. Test anxiety results from fear of failure. It is thought that they have investigated the source of unsuccessfulness in the exam, but they have not presented a strategy to reduce test anxiety. There are many students who suffer from the day of the exam. They have studied well and they have been taught well but they are as well afraid of exam and they cannot be successful as they expect themselves. A study by Horwitz and Young (1991) in United Kingdom, showed that test anxiety is a kind of anxiety considering apprehension over academic evaluation resulting from a fear of not being successful. Most learners study well and hard before they take an exam; they have confidence in what they have studied and what they have learned but they are afraid they cannot take an exam as well as they expect themselves. The studies have revealed that the source of this test anxiety is due to the failure of not getting good marks. The problem is that why the learners are worried about not getting good marks on the exam, although they have studied well and hard.

A study by Ohata (2005) carried out in Japan proved that most of the learners reported that they were afraid of taking tests, because test-taking situations would have them be worried about the negative result of getting a bad mark. There could be another source of this anxiety which makes the students fear getting a bad grade. Maybe the socio-affective strategies which the teachers apply in their classes are the source of this test anxiety.

Research based on error analysis of mathematics examination scripts has not been done. In this vein, Luneta (2008) comments that it is surprising that research on error analysis in mathematics has not taken centre-stage given its potential to help educators to identify students' skills and knowledge acquisitions that would guide the teaching and learning of these subjects. Also in Africa, Engelbrecht, Harding and Potgieter (2005) failed to find enough evidence to support the claim that students had more mathematical procedural understanding than conceptual understanding of, as this was not a study on error analysis. In Kenya, Brodie (2005) used the cognitive and socio-cultural perspectives of learning to explain learner reasoning that causes misconceptions during classroom mathematics discourses. International research involving Africa (Reddy, 2006) focused on mathematics and science tests, and the performance results were mainly used for statistical comparison purposes and not for analyzing errors in learners' scripts.

Secondary schools in Kenya have been performing poorly in KCSE creating worries among the parents, students and teachers. Due to this poor performance, the Ministry of Education, Science and Technology entered into joint venture with Japan International Cooperation Agency (JICA) to improve the performance in Mathematics, Biology, Chemistry and Physics, hence started a project which goes by the name "Strengthening Mathematics and Sciences in Secondary Education" (SMASSE).

According to SMASSE INSET- Fact Finding Report (2004) Strengthening Mathematics and Sciences in Secondary Education in-service project, a Kenya government initiative in collaboration with the government of Japan through Japan International Co-operation Agency (JICA) started operating on a pilot basis in July 1998 in nine districts namely Kisii, Kajiado, Maragua, Gucha, Makueni, Butere-Mumias, Kakamega, Murang'a and Lugari. In October 2000 its scope was extended under an in-country Training Program to include an additional six districts namely Meru South, Taita-Taveta, Kiambu, Kilifi, Baringo and Garissa.

In 2001 the project was expanded to other districts in the country. The project was introduced in Kieni Division in 2004, which was then in Meru Central District but now in the Imenti South District. The SMASSE project was to be covered in four cycles. The general trend in Kenya Certificate of Secondary Education (KCSE) as cited in the East African Standard February 16th 2002 has shown poor performance in Mathematics. The overall mean in mathematics at KCSE in the country showed a slight improvement in the year 2007 compared to the previous years. However, students overall performance in mathematics still remained poor (KNEC, 2011).

Therefore, this study attempted to examine what are some of the student factors influencing the number of errors in mathematics.

1.2 Statement of the Problem

As is argued by Wiens (2007) studying the causes of errors in mathematics is one of the research areas that have attracted little attention among many researchers despite it being relevant at present. In mathematics, students struggle with mathematics tasks. Students have performed very poorly in international comparison tests (Reddy, 2006). Moreover, there has been persistent increase in the number of errors made in mathematics particularly in the Kenya Certificate of Secondary Education examinations (KNEC, 2011). In addition, Aduda, (2003) argues that there has always been poor performance in the subject at national examinations.

Despite the myriad research endeavors at uncovering the factors that affect students' performance, gaps still exist in the area of the possible effect of some factors such as test anxiety; study habits as it affects students' number of errors during exam time. In this context, learner mathematics errors and misconceptions are not generally perceived as an important factor in this under-achievement, yet researchers have identified that learners' misconceptions are tenacious and resistant to change (for example Smith DiSessa & Roschelle 1993). They have argued that unless learners and teachers realize causes of errors in mathematics and they would be able to reduce the number of errors. This study attempted to establish the individual and collective effects of student factors influencing the number of errors in Mathematics among secondary schools students in Keiyo North, Elgeyo Marakwet County.

1.3 Purpose of the study

The purpose of the study was to establish selected student factors influencing number of errors in mathematics in Keiyo North, Elgeyo Marakwet County.

1.4 Objectives of the Study

The objectives of the study were:

i. To establish the effect of test anxiety on students' number of errors in mathematics

ii. To examine effects of class absenteeism on students' number of errors in mathematics

iii. To establish the effects of incentives for learning on students' number of errors in mathematics

iv. To determine effects of study habits on students' number of errors in mathematics.

1.5 Research Hypotheses

The study tested the following null hypotheses:

HO_1: There is no significant influence of test anxiety on students' number of errors in mathematics.

HO_2: There is no significant influence of absenteeism on students' number of errors in mathematics.

HO_3: There is no significant influence of incentives on students' number of errors in mathematics.

HO_4: There is no significant influence of Study habits on students' number of errors in mathematics.

1.6 Significance of the Study

The findings from this study are expected to be useful to the secondary schools in their efforts to reduce the number of errors in mathematics during examination time so as to meet the academic expectations of excellence of the students.

The Ministry of Education sets the standards required in learning mathematics in education sector through syllabus formulation and implementation. The findings will be useful to the Ministry in its efforts towards retooling and repositioning its efforts in boosting the learning of mathematics in secondary schools by reducing cases of carelessness.

The study will help students learning mathematics subject to reduce errors hence good overal performance for their future career dreams. The study will contribute to the existing body of knowledge on student factors influencing the number of errors in mathematics in secondary schools and will be used as a basis for subsequent researches in similar settings. This study will also benefit curriculum developers in identifying relevant teaching, counseling and mentorship programs to be used in mathematics students, for the realization of vision 2030.

1.7 Scope of the Study

The geographic scope of the study was done in 21 secondary schools in Keiyo North District, Elgeyo Marakwet County. The target group was students from the 21 secondary schools. The content scope of the study was student factors that influence number of errors in mathematics in secondary schools.

1.8 Limitation of the Study

The study was carried out in Keiyo North, Elgeyo Marakwet County with a few schools which were purposively selected. Hence the findings of the study cannot be 100% generalized in other areas in the country. Results can only be applicable to a region with similar parameters.

The reliability of the information obtained largely depended on the attitudes of the respondents. The researcher was able to convince the respondents on the importance of giving honest answer. In some schools there was reluctance in filling in the questionnaires, with the claim they were busy and also fear of victimization. The researcher took time to persuade them and clarified that the exercise will be mainly for academic purposes.

1.9 Theoretical Framework

The study adopted Behaviorist learning theory by Skinner (1957) which describes learning as the formation of associations between responses. A stimulus is that which is produced as a reaction to an individual organism. A response is the behavior which is produced as a reaction to a stimulus. The behaviorist learning theory illustrates learning as a mechanical process of habit formation. Ellis (2005) reviewed, a behavior becomes a habit when a specific stimulus elicits an automatic response from the learner. It can be formed either through classical conditioning or through instrumental learning. Habits entail 'over-learning', which ensures that learning of new habits, is a result of proactive inhibition. Thus, the challenge facing the learner is to overcome the interference of habits". Basing on the habit formation, most errors made by learners were the result of different learning behavior and other factors such as student anxiety

(Martin, 1996). Ellis (1985) assesses errors, according to the theory, were the result of non-learning, rather than wrong learning. But in either case, there was almost total agreement that errors should be avoided. From this theory, the teacher played a limited role where learners are engaged in active engagement, inquiry, problem solving, and collaboration with others. This informs the study by showing how a student's behavior in learning can increase or decrease students errors in mathematics depending on the study method used. To this end, attempts were made to predict when they would occur. In this way classroom practice was directed on the problem areas in order to help the learner overcome the negative effects of transfer.

1.10 Conceptual Framework

From a theoretical point of view, it is – consequently – hardly possible to integrate this existing variety of conceptual orientations, choices, and boundaries into a single conceptual framework. Therefore, this study preferred to reposition a number of these variables and processes into a conceptual framework (Figure 1.1), that serves as a guide to integrate theoretical perspectives that interlink these variables processes and assisted to explain the actual student factors influencing the number of errors in mathematics among students in the Kenyan context. Especially the fact that the study reused a number of research instruments that build on this big variety in concepts, requires us to be clear on how the original concepts are repositioned within the conceptual framework for our studies. This study assumes that test anxiety will cause students to make errors due to lack of full concentration, also being away from school many times, especially missing mathematics class is likely to increase the number of errors made by students. The study also hypothesizes that studying habits and incentives are most likely to relate with students number of errors in mathematics.

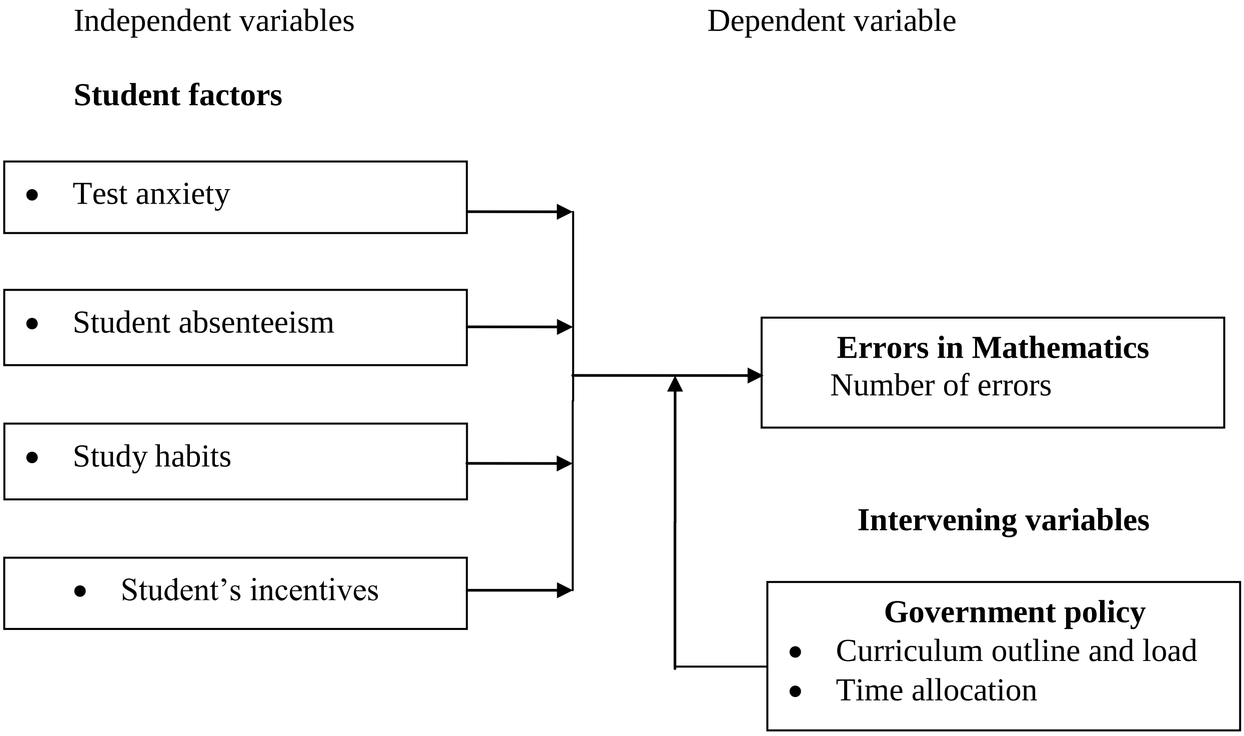

Figure 1.1 Conceptual Framework showing interrelation between the variables

Source: Researcher (2016)

1.11 Operational Definition of Terms

Absenteeism In school can be described as an act of staying away from school without permission

Errors in mathematic refer to Computational errors with whole numbers: in solving mathematics word problems, students may undertake computations which are completely or partly incorrect. Computational errors with fractions: in these types of mistakes, students make errors during calculations with fractions similar to computational errors with whole numbers. Computational errors with units: for solving problems, students do not undertake the needed unit transformation or do it incorrectly. Errors with averages and areas: these kinds of mistakes are related to unfamiliarity with necessary formulation or procedure in solving problems.

Incentives for learning are rewards in terms of monetary or non-monetary that make students want to do something or work harder.

Students' factors are students' behaviors such as studying habit, absenteeism and anxiety which may cause errors in math

Study habits are the behaviors used when preparing for tests or learning academic Materials.

Test anxiety occurs when a student excessively worries about doing well on a test. It is a combination of perceived physiological over-arousal, feelings of worry and dread, self-depreciating thoughts, tension, and somatic symptoms that occur during test situations

CHAPTER TWO

LITERATURE REVIEW

2.0 Overview

This chapter was to acquaint the reader with existing studies carried out in the area of student factors influencing the number of errors in mathematics as a subject. The chapter highlights the factors contributing to various errors in mathematics. The chapter also highlights theories and conceptual framework to the study.

2.1 Concept of Students Errors

The word error has different meanings and usages relative to how it is conceptually applied. Sanders and Moray (2001) define it as something that has been done which was not intended by the actor, not desired by a set of rules or an external observer, or that led the task or system outside its acceptable limits.

Reason (2005) sees students' error as a generic term to encompass all those occasions in which a planned sequence of mental or physical activities fail to achieve its intended outcome, and when these failures cannot be attributed to the intervention of some chance agency. Woods, Leila, Richard and Nadine (2004) define student error as specific variety of students' performance that is so clearly and significantly substandard and flawed when viewed in retrospect that there is no doubt that should have been viewed by the practitioner as substandard at the time the act was committed or omitted.

Most agree on fundamental aspects of student error, seeing it as the result of something that students do or intend to do that leads to outcomes different from what they had expected. Therefore, to be consistent with these views on student error, it would be defined as an action or decision that results in one or more unintended negative outcomes (Strauch, 2004). According to Johnson (2001) an error, in applied mathematics, is the difference between a true value and an estimate, or approximation of that value.

Legutko and Stando (2006), argue that students' error applied in mathematics, is the difference between a true value and an estimate, or approximation, of that value. In statistics, a common example is the difference between the mean of an entire population and the mean of a sample drawn from that population. In numerical analysis, round-off error is exemplified by the difference between the true value of the irrational number π and the value of rational expressions such as 22/7, 355/113, 3.14, or 3.14159.

Krygowska (2007) in his study argues that students can make a relative error in mathematics, which is the numerical difference divided by the true value; the percentage error is the ratio expressed as a percent. The term random error is sometimes used to distinguish the effects of inherent imprecision from so-called systematic error, which may originate in faulty assumptions or procedures. The methods of mathematical statistics are particularly suited to the estimation and management of random errors.

Students' challenges in errors for example fractions are well documented. On the 2007 NAEP test, fewer than half of Grade 8 students (49%) were able to correctly identify which arrangement of the fractions 2/7,1/2, and 5/9, showed the fractions ordered from least to greatest (U.S. Department of Education, 2008) and that there is a strong positive correlation between students' understanding of fractions and their overall success in mathematics (Gomez, 2009).

In many cases, however, student errors and incorrect responses are the result of students' partial understandings (Saxe, Gearhart, Sitabkhan, Earnest, Haldar and Lewis, 2010) or correct answers to slightly different questions (Wells & Coffey, 2005). Instead of considering incorrect responses as errors or mistakes to be avoided, students take the position that they are often a normal part of the development of a topic. Exposing and discussing students' partial understandings can be a very productive instructional strategy for deepening and refining students' thinking.

Wells and Coffey (2005) discussed how students' incorrect responses may actually be correct answers to related but different questions. For example, both 1/5 and 2/5 could be considered correct answers to the question of how to fairly share two candy bars among five children, depending on what is considered the whole. If the whole is one candy bar, then each child would get 2/5 of a candy bar. On the other hand, if the whole is the candy, then each child would get 1/5 of the candy. A third possibility is that each child would get1/5 of each candy bar.

The purposes of error analysis are to identify the patterns of errors or mistakes that students make in their work, understand why students make the errors, and provide targeted instruction to correct the errors. When conducting an error analysis, the teacher checks the student's mathematics problems and categorizes the errors (Ashlock, 2006; Tindal & Marston, 2009). From the above information, it is often tempting to dismiss student errors as merely careless mistakes or a sign of global misunderstanding of a topic. Interpreting errors as careless mistakes often leads teachers to assume that the student would produce the correct answer, if given the question on another day. Interpreting the student error as a sign of global misunderstanding of the topic often leads to completely re-teaching the content

2.2 Concept of Mathematics as a Subject

Cwik (2007) in his study defines mathematics as a group of related sciences, including algebra, geometry, and calculus, concerned with the study of numbers, quantity, shape, and space and their interrelationships by using a specialized notation**,** they could also be mathematical operations and processes involved in the solution of a problem or study of some scientific field.

Many times teachers and parents define mathematics as a study of numbers and arithmetic operations. Others focus on mathematics as a tool or collection of skills that can be applied to questions of how many or how much. These definitions quite often concentrate on the application of calculation skills to everyday problems involving quantification. Some adults comment that they must not be good at mathematics because they cannot balance their checkbooks (Dybiec, 2006).

Freudenthal (2000) in his study argues that another view of mathematics is that it is a science which involves logical reasoning, drawing conclusions from assumed premises, systematized knowledge, and/or strategic reasoning based on accepted rules, laws, or probabilities (decision analysis). Mathematics is also be defined as an art which studies patterns for predictive purposes. Another common view of mathematics is that it is a specialized language which deals with form, size, and quantity.

In examining mathematics from a historical perspective, one can see that much of its development was directed to describing patterns of relationship that were of interest to various individuals. In studying these patterns, a need for a specialized set of symbols (ideograms) developed. At the same time as these codes were being developed, a set of grammatical rules evolved for the appropriate use of these symbols. The early history of mathematics is replete with examples of human interest in patterns (concepts) which directly related to common experiences or phenomena (Krygowska, 2007).

Legutko and Stando (2006), argue that as the field of mathematics matured, the symbols and grammatical rules began to form a systematic structure that became a subject of study in it. From these events two types of mathematicians emerged: those known as applied mathematicians who were interested in how the symbols and codes could be related to human experiences or phenomena (isomorphism), and those referred to as pure mathematicians who devised systems of symbols to study the ramifications of selecting a particular set of rules (axioms). Although pure mathematicians generally show no interest in determining if their abstract studies have any relevance to human experiences or phenomena, applied mathematicians often study the work of pure mathematicians to see if their abstract systems might be linked to or explain the relationships underlying certain observed patterns ((Legutko, Legutko & Turnau, 2001). This synergistic relationship between pure and applied mathematician has enabled us to mature in our understandings about various fields of human endeavor and has added immeasurably to our technological sophistication

The major concern addressed by the Pentathlon Institute is what should constitute the mathematics curriculum and how should it be presented in educating our students. The major thrust of a mathematics curriculum from kindergarten through college should stress mathematical literacy so that each student can develop an understanding of how mathematics is relevant to the fields of endeavor they may eventually choose for themselves (Migon, 2007). This means that we must view our students as either potential applied mathematician who may use mathematics to enhance their own selected fields of endeavor or literate consumers of products from applied mathematics, Capable of understanding the mathematics used within their field

Learning experiences should be designed for students that provide greater potential for developing attitudes and thought processes consistent with being a user of or a consumer of applied mathematics. The very small percentage of students showing an interest in pure mathematics should be provided with additional mathematics courses that are taught by qualified pure mathematicians(Pellerey, 2001). Furthermore, the much larger group of potential applied mathematicians should be given a much richer variety of mathematical experiences then they are currently receiving

From the applied mathematicians' perspective, the symbols and codes of mathematics are not the concepts themselves but are an abstract representation of the concepts being studied. In order to understand and remember the underlying concepts which the symbols represent, physical and pictorial models can be used. Such models help students interpret patterns and relationships, connect these ideas to symbolic codes, and provide a means to remember these ideas through visual memory (Polya, 2003). A discipline (an organized, formal field of study) such as mathematics tends to be defined by the types of problems it addresses, the methods it uses to address these problems, and the results it has achieved (Rouche, 2008).

To a large extent, students and many of their teachers tend to define mathematics in terms of what they learn in mathematics courses. The instructional and assessment focus tends to be on basic skills and on solving relatively simple problems using these basic skills. As the three-component discussion given above indicates, this is only part of mathematics (Thom, 2004).

2.3 Error Theory

Mackie (2001) describes a theory according to which everyday thought in some area is sufficiently infected by mistaken philosophical views to be widely in error. Mackie believed that ordinary moral thinking involved belief in an objective, rationally compelling property of ‘to-be-doneness’ in things, but that this belief cannot be defended. An error theory stands directly opposed to the Wittgenstein (2001) view that ordinary language is perfectly in order as it is, and that only philosophical thought about it gives rise to confusion. The principal problem confronting an error theory is to say how our thinking ought to be remedied to free us of the error. One suggestion is wholesale eliminativism, counseling us to abandon the area entirely; other less radical moves would counsel various cleaning-up operations (Turnau, 1990).

2.3.1 Norman Theory of Error

Unlike Freud, contemporary error theorists consider the setting in which errors are committed when examining error. For instance, Norman (1988) studied both cognitive and motor aspects of error and differentiated between two types of error: slips and mistakes. This classification system is also known as the hybrid classification.

Slips are actions errors or error of execution that are triggered by schemas, a person's experience, memories and organized knowledge. Slips are unintended failures of execution that occur almost every day in our lives because attention is not fully applied to the task in hand. A few of us would have encountered something similar to pouring orange juice instead of milk into our cereal bowls while reading the newspaper. The act was definitely not intentional, but it was not attended to because attention was focused on the newspaper (Bruce, Rullo & McDonald 1990).

Mistakes are errors of thought in which a person's cognitive activities lead to actions or decisions that are contrary to what was intended. Mistakes can result from the shortcomings of perception, memory, cognition and decision-making and result in the failure to formulate the right intentions (Wickens & Hollands, 2000). To Norman, slips are errors that logically result from the combination of environmental triggers and schemas. Applying the lessons of slips to design such as standardizing the direction of rotation of window cranks in automobiles, would reduce the number of environmental triggers and therefore the likelihood of slips.

2.3.2 Rasmussen Theory of Error

Rasmussen (1983) expands the cognitive aspects of error that Norman and others described, and defines three types of operator performance and three types of associated errors: skill-based**,** rule-based and knowledge-based**.** It is widely known as the skills, rules and knowledge (SRK) classification scheme. The SRK model describes three different levels of cognitive processing that might be used by an individual during task performance. Rasmussen (1993) has reinforced this theory by justifying that the human operates at one of the three levels, depending on the nature of the task and the level of experience with the particular situation. That is, when information is first perceived and interpreted in the processing system, that information is processed cognitively in either the skilled- based, knowledge-based or rule-based levels, depending on the individual's degree of experience with the particular situation.

2.4 Effect of Test Anxiety on Students' Errors in Mathematic Subject

Most school-based performance measures are administered with a time limit which causes test anxiety leading to a lot of errors in the mathematics test (Dreyden & Gallagher, 2009). Timed mathematics performance is often worse than untimed mathematics performance because of the errors that occur in the timed performance (Kellogg, Hopko, & Ashcraft, 1999), even among gifted students (Dreyden & Gallagher 2009). This is because of insufficient time to complete all test problems or because the timed testing is sufficiently anxiety-provoking to hinder performance by causing so much errors.

It is important to assess the possible effects of test anxiety on errors hence performance, because high math anxiety may lead students to avoid math (Hembree, 2000) by choosing not to enroll in advanced (Ashcraft, 2002) or elective math courses (Ashcraft & Kirk, 2001). Math avoidance may ultimately affect whether a person decides against a math-related college major and subsequent career choices.

Although it will appear as common sense that mathematically gifted children experience little if any mathematics anxieties when solving mathematical problems, hence have little or no errors to make, there is little empirical evidence to either support or refute this notion (Lupkowski & Schumacker, 2001). Dreger and Aiken (2007) suggest that math anxiety occurs even among students gifted in mathematics hence leading to a lot of errors. Gifted children are often described as perfectionist (Parker, 2007); but it is unknown whether perfectionism enhances or exacerbates math errors, and whether effects of perfectionism interact with level of math anxiety among mathematically competent individuals.

Math test anxiety is one of the nonintellectual factors that affect a child's performance on mathematics due to the errors as a result of too much anxiety. Richardson and Suinn (2002) defined math test anxiety as the feeling of tension and anxiety that interferes with manipulation of numbers and the solving of mathematical problems in a wide variety of ordinary life and academic situations. Many studies of math test anxiety have focused on high-school and college students enrolled in grade-appropriate courses (Suinn, Edie, Nicoletti & Spinelli, 2002; Suinn, Taylor, & Edwards, 2008). For example, Kellogg *et al.* (1999) assessed math performance on timed versus untimed tests among 30 undergraduate psychology students who were assigned to one of three anxiety groups—low, medium, or high—based on self-reported ratings. Math performance scores were lower on the timed test due to lots of errors because of anxiety, to equivalent degrees, in all three groups.

Few studies have addressed whether similar effects occur in gifted individuals, or in children. Lupkowski and Schumacker (2001) found that the talented 15- to 18-year-olds in their study were less mathematically anxious than most college students; furthermore, they found no correlation between anxiety level and errors in the mathematics portion of the Scholastic Aptitude Test (SAT). This shows that despite the study lack of evidence on the relation between anxiety level and errors in the mathematics, there is still a need to carry more research on the two variables.

Studies point out a host of factors associated with mathematics test anxiety. These variables range from environmental factors such as family pressure for higher achievement, to intellectual factors as learning styles or to personality factors such as low self-esteem (Uusimaki & Nason, 2004; Woodard, 2004). In other words, mathematics test anxiety is a multifaceted construct with affective and cognitive dimensions. Personality, self-concept, self-esteem, learning style, parental attitudes, high expectation of parents, negative attitudes toward mathematics, avoidance of mathematics, teachers' attitudes, ineffective teaching styles, negative school experiences and low degree of achievement in mathematics are among the concepts and constructs related to mathematics test anxiety (Bursal & Paznokas, 2006; Hopko, McNeil, Lejuez, Ashcraft, Eifert and Riel, 2003; Ma & Xu, 2004; Reynolds, 2001; Woodard, 2004).

Mathematics test anxiety in elementary school students indicates that its onset coincides with early years of schooling. This could in part be due to social learning from parents and teachers with mathematics anxiety or negative perceptions of math. Parents or teachers might give children mixed messages (Williams, 1998; as cited in Thomas & Furner, 2007) about mathematics. They might emphasize how highly difficult mathematics is and at the same time tell them how mathematics skills are of essential importance for their future achievements. Vann (2003) observed that mathematics anxiety in mothers was significantly predictive of mathematics anxiety in children. This could be so for excessive expectations as well. As pointed out by Geçtan (2005) children of parents with excessive expectations whose love and acceptance is conditional to how well children live up to these expectations have high degree of anxiety. These circumstances might lead to self-consciousness about one's performance and to anxiety arising from not living up high standards of parents. Children's excessive self-critical attitude might cause anxiety disproportionate to their failure in living up to these expectations. In fact, studies do show that low self-esteem, confidence and efficacy are closely related to mathematics anxiety (Uusimaki & Nason, 2004; Woodard, 2004).

Negative school experiences might also contribute to the development of mathematics test anxiety hence a lot of errors in the mathematics tests. (Bursal & Paznokas, 2006). For example, teachers' threatening and authoritarian attitudes could lead to fearsome classroom climate in which student might hesitate to ask questions or answer the teachers' questions. Furthermore, students fearing their mathematics teacher might have a conditioned reaction to mathematics as well. Observing teachers giving mathematics homework as punishment could also cause students perceive mathematics as unpleasant (Oberlin, 2002; as cited in Thomas & Furner, 2007).

As punishment is inherently negative, extra mathematics assignments as punishment could play a role in cultivating negative attitude toward mathematics tests in students who receive the punishment as well as those who witness it. Low grades or failure in mathematics could also lead to mathematics anxiety hence lots of errors or exasperate students' existing levels of anxiety for mathematics (Ma & Xu, 2004; Norwood, 2004; Reynolds, 2001; Satake & Amato, 2005; Townsend, Moore, Tuck, & Wilton, 2008). Failure in mathematics, fear and anxiety about it could cause extreme feelings of dislike about mathematics. Indeed, Hopko *et.al*, (2003) observed that persons with mathematics anxiety make more mistakes in dealing with mathematics problems. Such mistakes lead to lower grades in mathematics which in turn increases anxiety about math. As such, the vicious cycle of anxiety, failure and anxiety is perpetuated.

Poor performance in mathematics has been linked to an increase in mathematics test anxiety leading to a lot of errors and poor performance (Furner & Duffy, 2002; Hopko *et.al*, 2003). Belief and expectations to perform poorly on mathematics problems could also lead to mathematics anxiety (Ozer, 2007; Reglin, 2000) or intensify students' existing anxiety. Mathematics anxiety can be experienced to such a degree that children might perceive their performance in mathematics as a measure of their self-worth and a reason for losing value in the eyes of parents and teachers. However, since they do have to deal with mathematics, these beliefs lead to a great deal of distress and unease (Gierl & Bisanz, 2005; Kazelskis, 2009; Townsend *et. al.*, 2008).

This study therefore highlighted on the effects of test anxiety on students' errors in mathematics subject.

2.5 Influence of Absenteeism on Students' Errors in Mathematic Subject

Researchers have reached consensus that regular attendance to schools and lack of absenteeism is differentially effective in teaching mathematics because students will earn more on how to cope with their errors hence low amount of errors will be made in mathematics, as evidenced in the school effectiveness movement (Teddlie & Reynolds, 2000).

Among school characteristics influencing mathematics achievement, researchers have attended to school context and climate (e.g., Lee, 2000; Ma & Klinger, 2000) and school policies and practices which strongly punish absenteeism hence leading to less errors among students taking mathematics (Lee, Croninger, & Smith, 2007; Luyten 2004).

Researchers have also investigated the effects of absenteeism on mathematics coursework and mathematics achievement, examining the impact of the number (amount) and the type (content) of mathematics courses. Sebring (2007) noted that the quantity of mathematics coursework had an effect on mathematics achievement. It is noted that lack of absenteeism leads to regular attendance of classes hence complete mastery of mathematics as a subject leading to low amount of errors among students hence high performance in mathematics subject.

Gamoran, Porter, Smithson & White (2007) reported that students who did not have much absenteeism performed better on standardized mathematics achievement tests due to fewer errors if they take more mathematics courses, and mathematics coursework. Grouping students based on those with more absenteeism and those with less found out that, students with less absenteeism had less errors in mathematics courses and had higher mathematics achievement (Gomez, 2009).

Overall, there has been a push to raise the academic standards in mathematics by increasing the level of school attendance and the number of mathematics courses students must complete to graduate from high school hence less errors and high performance in mathematics (Hoffer, 2007). However, many schools have responded to this requirement by offering more low-level mathematics courses.

The reasons why absenteeism has a negative effect on grades of mathematics due to lots of errors are obvious. If a student is not present in class, something might be explained which the student won't understand later on, he/she could miss a homework or an assignment because he/she didn't know, or maybe the student will fall behind and have a hard time catching up with the rest of the class (McNamara & Shaughnessy, 2010). Hence the need to look into students’ factors mainly absenteeism influencing errors in mathematics among secondary school students in Elgeyo Marakwet County.

2.6 Influence of Incentives for Learning on Students Errors in Mathematic Subject

Some students seem naturally enthusiastic about learning mathematics, but many need-or expect-their instructors to inspire, challenge, and stimulate them: Effective learning in the classroom depends on the teacher's ability to maintain the interest that brought students to the course in the first place bringing about low amount of errors made by students' hence high performance (Ericksen, 2008).

Unfortunately, there is no single magical formula for motivating students to do better in mathematics. Many factors affect a given student's incentive to work and to learn mathematics (Bligh, 2001; Sass, 2009): interest in the subject matter, perception of its usefulness, general desire to achieve, self-confidence and self-esteem, as well as patience and persistence. And, of course, not all students are motivated by the same values, needs, desires, or wants. Some of the students will be motivated by the approval of others, some by overcoming challenges. This incentive will bring magic in reducing the amount of errors made by students in mathematics as a subject (Saxe *et al*, 2010).

Researchers have begun to identify those aspects of the teaching situation that enhance students' self-motivation hence low level of errors in mathematics (Bligh, 2001, Lowman, 2004; Lucas, 2000; Weinert & Kluwe, 2007). To encourage students to become self-motivated independent learners, instructors can do the following: Give frequent early positive feedback that supports students' beliefs that they can do well, ensure opportunities for students' success by assigning tasks that are neither too easy nor too difficult, Help students find personal meaning and value in the material, Create an atmosphere that is open and positive and help students feel that they are valued members of a learning community.

Research has shown that doing everyday mathematics teaching, practicing it, can do more to counter student apathy hence reduce the number of errors made in mathematics than special efforts to attack motivation directly (Ericksen, 2008). Most students respond positively to a well-organized course taught by an enthusiastic instructor who has a genuine interest in students and what they learn.

Capitalizing on students' existing needs should be done in order to improve mathematics learning by reducing the number of errors made. Students learn best when incentives for learning mathematics in a classroom satisfy their own motives for enrolling in the course. Some of the needs students may bring to the classroom are the need to learn something in order to complete a particular task or activity, the need to seek new experiences, the need to perfect skills, the need to overcome challenges, the need to become competent, the need to succeed and do well, the need to feel involved and to interact with other people. Satisfying such needs is rewarding in it, and such rewards sustain learning more effectively than do grades. Design assignments, in-class activities, and discussion questions to address these kinds of needs (McMillan & Forsyth, 2001).

Making students active participants in learning mathematics is an incentive that greatly reduces the number of errors made in mathematics. Students learn by doing, making, writing, designing, creating, solving. Passivity dampens students' motivation and curiosity. Pose questions. Don't tell students something when you can ask them.

Encourage students to suggest approaches to a problem or to guess the results of an experiment. Use small group work and this will greatly improve performance by reducing the number of errors made in mathematics (Lucas, 2000).

One should ask students to analyze what makes their mathematics classes more or less motivating. Sass (2009) asks his classes to recall two recent class periods, one in which they were highly motivated and one in which their motivation was low. Each student makes a list of specific aspects of the two classes that influenced his or her level of motivation, and students then meet in small groups to reach consensus on characteristics that contribute to high and low motivation. In over twenty courses, Sass reports, the same eight characteristics emerge as major contributors to student motivation hence low level of errors and therefore high achievement in mathematics (Altun, 2005).

Research has shown that a teacher's expectations have a powerful effect on a student's performance in mathematics. If one acts as though one expects his/her students to be motivated, hardworking, and interested in the course, they are more likely to be so. Set realistic expectations for students when you make assignments, give presentations, conduct discussions, and grade examinations (American Psychological Association, 2002; Bligh, 2001; Forsyth & McMillan, 2002 Lowman, 2004). Glewwe, Park and Zhao (2010) conducted a randomized trial over a two & year period that provided primary school (class 4 & 8) teachers in 50 rural Kenyan schools incentives based on student performance on district level exams in 7 subjects. Students in treatment schools had higher test scores (averaged over all subjects) in the second year, the gains dissipated in the third year after the program ended. However, this study did not investigate causality of incentives on errors. Therefore, this study addressed the cause effect of student's incentives on student number of errors in mathematics.

2.7 Influence of Study Habits on Students Errors in Mathematics Subjects

Arslan and Eraslan (2003) in their study argue that a study habit of trying to do too much studying of mathematics at one time is a poor studying habit that will cause a lot of errors, it will also tire and one's studying will not be very effective. One should space the work over shorter periods of time to be more productive and to avoid mathematical errors. Taking short breaks will restore one's mental energy hence bring about a lot of high achievement in mathematics as a subject.

Study time is any time one is doing something related to school work. It can be completing assigned reading, working on a paper or project, or studying for a test. One should schedule specific times throughout the week for study time dedicated to studying mathematics in order to have a consistent time of study (Bindak, 2005). This will greatly avoid errors in mathematics hence contribute to higher achievement in mathematics.

Bruno (1999) argues that studying at the same times each day is a study habit that establishes a routine that becomes a regular part of one's life, just like sleeping and eating. When a scheduled study time comes up during the day, one will be mentally prepared to begin studying particularly mathematics hence due to the high level of concentration, less errors will be made in mathematics. Setting goals will help one stay focused and monitor their progress in their performance in mathematics. Simply sitting down to study has little value. One must useful studying habit that brings improvement in performance and in the errors made in mathematics (Bursal & Paznokas, 2006).

One may delay starting studying because they don't like an assignment in mathematics or think it is too hard. A delay in studying is called procrastination. If one procrastinates for any reason, they will find it difficult to get everything done when they need to. They may rush to make up the time they wasted getting started, resulting in careless work and errors (Casey, Nuttall & Pezaris, 2007).

Reviewing one's notes can help one make sure they are doing an assignment correctly. Also, notes may include information that will help complete an assignment hence lead to less error (Cook, 2008). Too study problems can occur if friends call during study times. First, mathematics work is interrupted. It is not that easy to get back to what one was doing hence creating a lot of errors. Second, friends may talk about things that will distract from what one's need to do (D'Ailly & Bergering, 2001). From the above literature the study shows that studying habit influence students learning and performance. The study also suggests that studying habit can cause carelessness which may lead to errors. However, there was limited empirical evidence particularly in Kenya of relationship between errors in mathematics and students studying habit. Therefore, the study examined the effect of student number of errors and study habit.

2.8 Chapter Summary

There is an extensive literature on error analysis in general. One of the potential implications of research on students' errors is that instruction might be designed to address directly the specific deficits that the error analysis helps us to diagnose. However, it may be worth noting that researchers are not well aware of the possibility factors related to student mathematics errors.

Various studies have pointed out that the errors of mathematics among students tends to center on analyses and critiques, on differences, rather than on syntheses and consensus that may eventually lead to better practice in the teaching and learning of mathematics. However, this study did not show which factors causes error in mathematics, hence the gap of the study. This study will focus on evaluating different factors that cause errors in mathematics during exam time. Mathematics education researchers also need to collaborate more with other researchers, for example sociologists and anthropologists, and to give greater prominence to institutional context and constraints. Also studies on anxiety and student mathematics reported that there is not a complete confounding of mathematics anxiety and mathematics competence. However, other shows negative while others show no effect of anxiety on student errors. This provides contradictory results on effect of student anxiety on mathematical errors.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.0 Overview

This chapter deals with the procedures and methods the researcher used to obtain data for the study. It discussed the research design, study variables, the study area, sampling procedures and data collection instruments. The validity and reliability of research instrument used and data analysis procedures are presented.

3.1 Area of Study

The study was conducted in secondary schools in Keiyo North, Elgeyo Marakwet County. Elgeyo Marakwet County is located in the former Rift Valley Province. The largest town is Iten. It borders the counties of West Pokot to the north, Baringo County to the east, southeast and south, Uasin Gishu to the southwest and west, and Trans Nzoia to the northwest. Keiyo north is an electoral constituency in Kenya. It is one of four constituencies of Elgeyo-Marakwet County. The constituency was established for the 1969 elections. It was previously one of two constituencies of the former Keiyo District.

3.2 Research Design

The research employed a descriptive survey design. The study aimed at collecting information from respondents on their perception and opinion in relation to student factors influencing the number of errors in mathematics. The purpose of descriptive design is to provide an accurate portrayal or account of the characteristics, for example behavior, opinions, abilities, beliefs, and knowledge of a particular individual. A descriptive research gave a thorough and accurate description survey by determining the "how" or "why" the phenomena came into being, and also what was involved in the situation. This was achieved by portraying an accurate profile of the events and situations (Robson, 2002). A descriptive survey was selected because it provided an accurate portrayal or account of the characteristics, for example behavior, opinions, abilities, beliefs, and knowledge of a particular individual (Burns & Grove, 1993). The study investigated and described the nature of prevailing conditions pertaining to the teacher's knowledge of the situation or group (Burns & Grove, 1993). This design was chosen to meet the objectives of the study, namely to determine the knowledge and views of respondents regarding student factors influencing the number of errors in mathematics.

3.3 Target Population

The target population comprised of students of public secondary schools in Keiyo North, Elgeyo Marakwet County. Report at the county Education Office indicated there is a total of 21 public secondary schools in the Keiyo North with a total of 6991 students. The accessible population comprised of the 2369 Form 2 and 3 students who were in their current classes during the period of conducting the study.

3.4 Sample Size and Sampling Procedures

A sample is a small part of large population, which is considered to be representative of the larger population (Orodho, 2012). There was need to obtain data from a smaller group or division of the total population in such a way that the knowledge added was representative of the total population under study.

The researcher first stratified the sub-county into two divisions through a stratified sampling technique. According to Creswell (2008) the objective of stratified sampling was to attain a required representation from various subgroups in the population. Schools were categorized according to the divisions as indicated in Table 3.2. After which the study used 30% of total number of schools to obtain the study sample size. According to Mugenda and Mugenda (2003) for a population of 1-100 a sample of 100% was used as a sample size, for a population of 100-1000, 30% of the population was used as a sample size. Thereafter the study used 10% to select students from each strata. According to Yount (2006) less than 30 percent sample was suitable for a survey design. The Table 3.1 shows the sampling frame of the study. Participants were selected by simple random sampling technique (Creswell, 2008). A total of 237 participants were selected.

Table 3.1 Sampling Frame

Divisions	**Total number of schools**	**Total number of students**	**Sample schools**	**Sample Students**
Tambach	8	895	3	90
Kamariny	13	1474	4	147
Total	**21**	**2369**	**7**	**237**

Source: Researcher (2013)

3.5 Data Collection Instruments

Questionnaires were used for collection of primary data from secondary schools' students. The questionnaires were chosen because it provided a more comprehensive view than any other research tool. Questionnaire was used to obtain primary data from the sampled population. A questionnaire refers to a collection of items to which a respondent was expected to react usually in written (Kothari, 2008). Sekaran (2013) suggests that questionnaires are resourceful as data collection instrument which provides the researcher to know what is required and how to measure the variables of concern. Questionnaires are easy to administer and analyze. The questionnaires are advantageous because they cover a large population within a short time and minimal cost on the part of the researcher and intensify independence and accuracy of responses from the respondents (Sekaran, 2013). Structured questionnaires were administered to the sampled secondary school students.

The questionnaires were formulated according to study objectives in a systematic procedure. The questionnaire contains two sections; section A contains students' demographic factors while section B covers students' factors which include test anxiety, absenteeism, studying habit and incentives. Five point Likert scale was used to measure statement such as "worrying too much when exam is near". The researcher administered the questionnaires personally to the respondents and thereafter the filled questionnaires were collected immediately for data analysis.

3.5.1 Document Analysis

This study analyzed the following documents; Continuous assessment test and end of term marked exam answer sheets.

3.6 Piloting of Research Instruments

Instrument piloting is a crucial element of a good study design. The questionnaire used in the study was pre- tested through a pilot study before actual data collection.

This enabled the revision of the questionnaires before actual data collection in terms of their content.

To establish reliability of research instruments, a pilot study was carried out in 3 secondary schools in Uasin Gishu County. Piloting was to ensure as much as possible that the items would elicit and give the kind of responses the researcher intends to get and that they were acceptable in terms of their content. The researcher verified their content for accuracy, consistency and ensures that unclear information was removed while deficiencies and weakness were noted and corrected in the final instruments (Creswell, 2008). This ensured simplicity and suitability of the items. The feedback from the piloted secondary schools helped the researcher in revising the questionnaire to ensure that they cover the objectives of the study adequately.

3.6.1 Validity of the Research Instrument

Validity refers to degree to which evidence supports any inferences a researcher makes based on the information collected using particular instrument (Fraenkel, Wallen & Hyun, 2012). In this study, two types of validity were tested; face validity and content validity. Face validity refers to the likelihood that questions in an instrument were understood. To improve on the face validity, a pilot study was conducted after which responses to each item was scrutinized to identify any misunderstandings and ambiguity. Items found to be unclear or ambiguous were modified thereby improving face validity. Content validity, refers to whether an instrument provides adequate coverage of the topic. Expert Opinions, Literature searches and pre-testing of open-ended questions was used to improve the content validity. The questions in the questionnaire were brainstormed with colleagues and there after necessary corrections was made. Suggestion and advice offered was used as a basis to modify the research items and make them more adaptable in the study. Their feedback was used to revise the instrument. In addition, the researcher conducted the study in person in order to ensure systematic validity.

3.6.2 Reliability of the Research Instruments

Reliability refers to the degree to which the instrument yields the same results on replicated trials (Orodho, 2009). It is therefore the degree of constancy or whether it can be relied upon to produce the same results when used in two or more attempts to measure theoretical concepts. Reliable measuring tool need not be applicable (Kothari, 2008). To ensure reliability of the questionnaires, a pilot study was carried out in the neighbouring Uasin Gishu County. This area was used for piloting because the two counties share similar conditions. Cronbach Alpha was used to determine a reliability index. The study found a Cronbach Alpha coefficient more than 0.7 meaning the research instrument was reliable. The piloting of the questionnaire was used to identify faults leading to its reliability. Data was analysed by use of SPSS software. According to Wells (2003) a reliability index of more than 0.7 is considered ideal for the study.

3.7 Data Collection Procedures

To collect data, questionnaires were used; the researcher visited the respective selected secondary schools to obtain samples of students. Students were given questionnaires. The instructions on how to fill the questionnaires were carefully explained to the respondent. Sufficient time was allowed for them to respond to the instruments accurately. After responding to the questionnaires, the researcher collected data and thanked the respondents. An introductory letter from University of Eldoret was given to the researcher so as to secure a permit from the National Commission for Science, Technology and Innovation (NACOSTI) for the purpose of conducting research in selected sampled secondary schools in Keiyo North, Elgeyo Marakwet County. When the permission was granted, the researcher booked an appointment with County Commissioners' office and also consulted with the schools heads.

3.8 Data Analysis

The questionnaires were collected by the researcher, were coded and keyed into the SPSS version 20 software and analysed. Screening of data was done using sort functions. Data was based on the objectives of the study. From the results, the researcher made a sense data. Quantitative data collected was analysed using descriptive statistical techniques which are frequencies, mean, standard deviation. Measures of central tendency were to give expected summary statistics of the variables tested. The findings were presented by use of frequency distribution tables that gave a record of a number of times a score or a response occurred. Pearson correlation was used to test hypothesis, with p value based on 0.05 level of significance. From the frequencies and observation that was made, the researcher made conclusions and recommendations.

3.9 Ethical Considerations

The participants were assured that the information given was to be treated confidentially and for the purpose intended only. The researcher respected the respondents' privacy. The participants were expected not to write their names on the questionnaire, but each questionnaire had a code number for reference. They also had the freedom to withdraw from the study at any point or time. The researcher was to inform the respondents that they had a right not to participate in the study if they so wish. The study also informed the respondents that they had a right to withdraw from the study at any time without giving a reason as to their withdrawal regarding the right to privacy of the respondents. In all cases, names were kept confidential. The findings of the research were used for research purposes.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS, DISCUSSION AND INTERPRETATION

4.0 Overview

This chapter presents results of this study based on the formulated objectives and hypotheses as presented in chapter one. The findings were collected from students of public secondary schools in Keiyo North, Elgeyo Marakwet County. Data collected was quantitatively analyzed and presented in tables. Discussions of the findings were given in under the information presented.

4.1 Response Rate

The study findings in table 4.1 revealed that 237 questionnaires were distributed to students. Out of the two hundred and thirty-seven questionnaires, two hundred and thirteen (213) questionnaires were returned giving a response rate of 89.87% which is considered acceptable.

Table 4.1 Responses Rate

Target group	Questionnaire Issued	Questionnaire Returned	Responses Rate (%)
Students	237	213	89.87%

4.2 Demographic Information for Students

The study sought to establish the demographic information of the students. This information was useful in determining the answers of the respondents in relation to their gender, age and class. From the findings, majority 63.4% (135) of the respondents were female and 36.6% (78) of the respondents were male. This tentatively implies that secondary schools in Keiyo North had more male students than female students.

In regards to the age bracket, 73.2% (156) of the respondents were between 16-20 years and 26.8% (57) of the respondents were between 10-15 years. Further, 61% (130) of the respondents were form two students and 39% (83) of the respondents were form three students. The results clearly show that majority of the students are in their adolescence hence they are ideal for the study since students at this age bracket are more likely to absent themselves from class due to peer pressure and difficulty in contextualizing what is learnt in class.

Table 4.2 Demographic Information for Students

		Frequency	Percent
Gender (sex)	Male	78	36.6
	Female	135	63.4
	Total	**213**	**100**
Age bracket	10 - 15 years	57	26.8
	16-20	156	73.2
	Total	**213**	**100**
	Form 2	83	39
	Form 3	130	61
Class	**Total**	**213**	**100**

4.3 Demographic Information of Students' Parents

This section focused on the demographic information for students' parents'.

4.3.1 Parent Level of Education

From the findings, 43.7% (93) of the respondents had reached secondary level of education, 27.7% (59) of the respondents had reached university level of education, 14.6% (31) of the respondents had advanced to college level, 11.7% (25) of the respondents had reached primary level of education and 2.3% (5) of the respondents reported that they were holders of other levels of education particularly CPA (K). From the findings, it is evident that most of the parents have advanced beyond primary level. This is an indication that parents have a high expectation of students' in regards to performance in Mathematics. As such, the high expectation accorded to students by parents is likely to create anxiety in them to meet the expectation. In so doing, they commit errors. This was supported by Musgrave (2000) who said that a child that comes from an educated home would like to follow the steps of his or her family and by this, work actively in his or her studies. He said further that parents who have more than a minimum level of education are expected to have a favored attitude to the child's education and to encourage and help him or her with school work.

Table 4.3 Parent Level of Education

		Frequency	**Percent**
Parent's/Guardian's level of education	Primary	25	11.7
	Secondary	93	43.7
	College	31	14.6
	University	59	27.7
	Other	5	2.3
	Total	**213**	**100**

4.4 Mothers Occupation

In relation to mothers' occupation, 41.8% of the respondents reported that their mothers are farmers, 17.4% of the respondents stated that their mothers' are teachers and 13.6% of the respondents reported that their mothers' are self-employed. Further, 7% of the students stated that their mothers' are accountants, 6.6% of the students stated that their mothers' are doctors. As well, 6.6% of the students stated that their mothers' are nurses. Finally, 3.8% of the students stated that their mothers' are housewives, 2.3% of the respondents stated that their mothers' are police officers and 0.9% of the respondents stated that their mothers' are hostess.

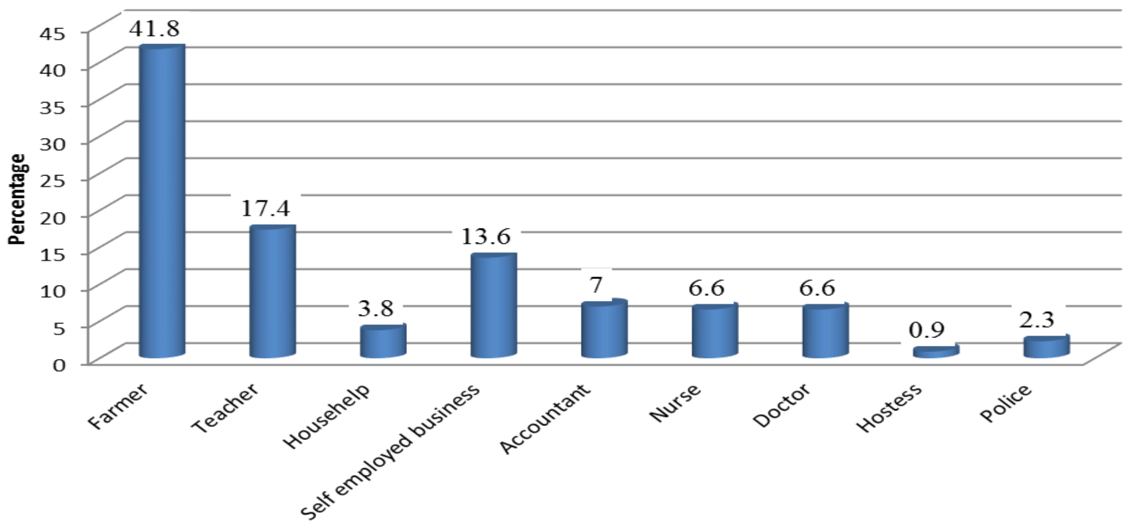

Figure 4.1 Student's Mothers Occupation

4.5 Fathers' Occupation

The researcher also sought to establish fathers' occupation. As evidenced in figure 4.2, 40.4% of the students stated that their father is a farmer, 10.3% of the students reported that their father is a businessman and 9.9% of the students stated that their father is a teacher. As well, 9.9% of the students reported that their father is a doctor, 8.5% of the students stated that their father is a soldier and 5.2% of the students stated that their father is an engineer. Moreover, 4.2% of the students reported that their father is a government official, 2.8% of the respondents reported that their father is a banker, 2.8% of the students reported that their father is a lawyer and 1.4% of the respondents stated that their father is a plumber. Further, 1.4% of the students reported that their father is a tailor, 1.4% of the students reported that their father is a carpenter, 0.9% of the students reported that their father is a driver and 0.9% of the students reported that their father is an accountant. According to Alissa (2010) Children's test scores are lowest when parents are in better occupation generations and highest when material advantage is long-lasting.

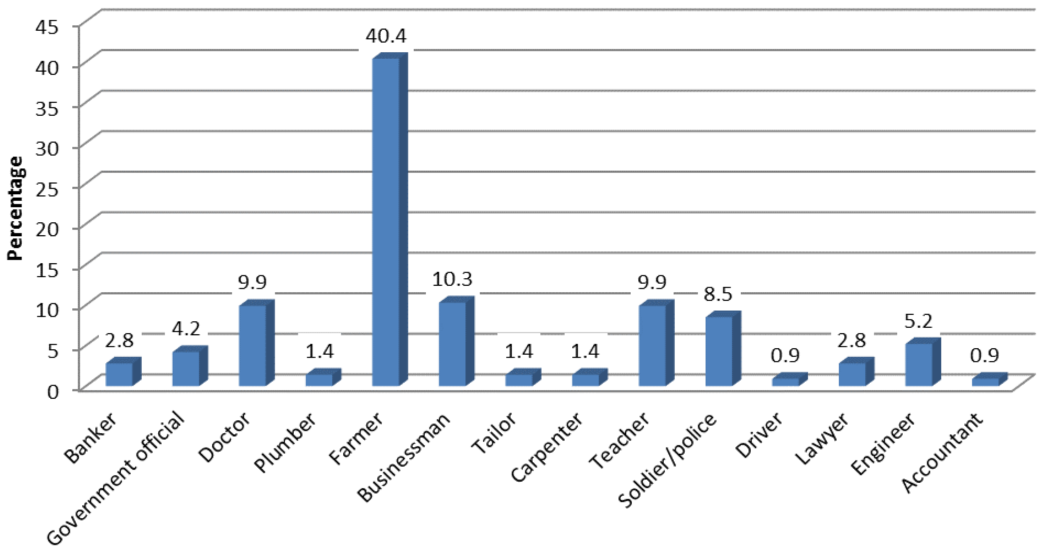

Figure 4.2 Student's Fathers Occupation

4.6 Students Mathematics Performance

The results on students' mathematics performance are presented in figure 4.3. From figure 4.3 it is evident that majority (73%) of the respondents has an average performance, 21% of the respondents have very good performance, 4% of the respondents have poor performance and 2% of the respondents have very poor performance. As a result, there is cause for concern since majority of the students have an average performance. If the same trend continues, students may find themselves unable to compete academically with schools from other Counties and they are most likely to miss out on career opportunities. This prompted the researcher to find out the reasons as to why this is the trend among secondary schools in Keiyo North, Elgeyo Marakwet County.

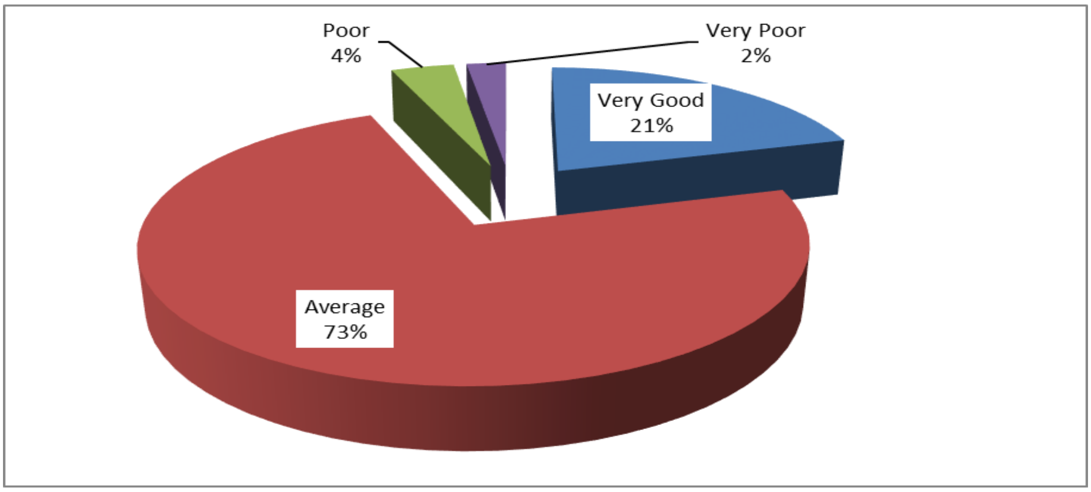

Figure 4.3 Students Mathematics Performance

4.7 Students' Test Anxiety

Student test anxiety was established by the researcher. The findings are presented in table 4.4. From the findings, 32.9% (70) of the respondents agreed that they feel un-relaxed and uneasy during mathematics examinations, 18.8% (40) of the respondents strongly agreed on this statement, 18.8% (40) of the respondents disagreed, 23% (49) of the respondents disagreed and 6.6% (14) of the respondents were neutral (mean = 3.06). Similarly, 25.8% (55) of the respondents agreed that they feel uneasy and nervous during mathematics tests, 19.7% (42) of the respondents strongly agreed on this statement, 32.4% (69) of the respondents strongly disagreed, 20.7% (44) of the respondents disagreed and 1.4% (3) of the respondents were neutral (mean = 2.8).

As well, 19.2% (41) of the respondents agreed that they worry too much that other students might understand the problem better than them when the teacher is showing the class how to do a problem, 16.9% (36) of the respondents strongly agreed, 36.2% (77) of the respondents strongly disagreed, 25.8% (55) of the respondents disagreed and 1.9% (4) of the respondents were undecided (mean = 2.55).In a similar vein, 21.6% (46) of the respondents agreed that taking mathematics tests scares them, 10.3% (22) of the respondents strongly agreed, 31.5% (67) of the respondents strongly disagreed and 5.2% (11) of the respondents were undecided (mean = 2.48).

Moreover, 10.8% (23) of the respondents agreed that they dread having to do Mathematics, 16% (34) of the respondents strongly agreed, 36.6% (78) of the respondents strongly disagreed, 27.2% (58) of the respondents disagreed and 9.4% (20) of the respondents were undecided (mean = 2.42). Further, 20.2% (43) of the respondents agreed that they worry too much that they will do poorly whenever the teacher says he/she is going to ask them some questions to find out how much they know about Mathematics, 8.9% (19) of the respondents strongly agreed, 36.6% (78) of the respondents strongly disagreed, 28.2% (60) of the respondents disagreed and 6.1% (13) of the respondents were undecided (mean = 2.37).

Finally, 18.8% (40) of the respondents agreed that they are scared whenever they think they will be doing a Mathematics exam, 9.4% (20) of the respondents strongly agreed, 44.1% (94) of the respondents strongly disagreed, 24.4% (52) of the respondents disagreed and 3.3% (7) of the respondents were undecided (mean = 2.25). In a nutshell, students perceive their performance in mathematics as a measure of their self-worth hence they dread having to do Mathematics, they are scared of taking mathematics exam and they feel very nervous and uneasy while taking mathematics tests. Due to the fact that they have no option other than dealing with mathematics they tend to be distressed hence they are more likely to make errors during Mathematics test. The study findings are similar to Dreger and Aiken (2007) who posit that mathematics anxiety is also exhibited by students that are gifted in Mathematics thereby leading to a lot of errors. As well, Bursal & Paznokas, (2006) stated that negative school experiences leads to development of mathematics test anxiety hence a lot of errors in the mathematics tests. Further, failure in mathematics could also lead to mathematics anxiety hence lots of errors in mathematics (Ma & Xu, 2004; Norwood, 2004; Reynolds, 2001; Satake & Amato, 2005; Townsend et al, 2008).

Table 4.4 Students' Anxiety

		SD	D	UD	A	SA	Mean	Std. Dev.
When the teacher says he/she is going to ask you some questions to find out how much you know about mathematics, I worry too much that i will do poorly	F	78	60	13	43	19	2.37	1.38
	%	36.6	28.2	6.1	20.2	8.9		
When the teacher is showing the class how to do a problem, I worry too much that other students might understand the problem better than me	F	77	55	4	41	36	2.55	1.54
	%	36.2	25.8	1.9	19.2	16.9		
When I am in mathematics examinations class, I usually feel not at all at ease and relaxed.	F	49	40	14	70	40	3.06	1.48
	%	23	18.8	6.6	32.9	18.8		
When I am taking mathematics tests, I usually feel very nervous and uneasy.	F	69	44	3	55	42	2.8	1.59
	%	32.4	20.7	1.4	25.8	19.7		
Taking mathematics tests scares me. I very often feel this way	F	67	67	11	46	22	2.48	1.39
	%	31.5	31.5	5.2	21.6	10.3		
I dread having to do mathematics. I very often feel this way	F	78	58	20	23	34	2.42	1.47
	%	36.6	27.2	9.4	10.8	16		
It scares me to think that I will be taking mathematics exam	F	94	52	7	40	20	2.25	1.42
	%	44.1	24.4	3.3	18.8	9.4		

4.8 Absenteeism

Student absenteeism was also established by the researcher. The results are presented in table 4.5. From the table, 54.5% (116) of the respondents strongly disagreed that whenever they have double lesson for Mathematics, they stay at home (mean = 1.54). As well, 48.8% (104) of the respondents disagreed that they are always late in Mathematics class (mean = 1.62). Also, 49.3% (105) of the respondents strongly disagreed that their peers tell them not to attend mathematics class (mean = 1.76). Further, 41.3% (88) of the respondents strongly disagreed that they do not like attending Mathematics class. Finally, 45.5% (97) of the respondents strongly disagreed that they would rather go to another class than being in a Mathematics class (mean = 2). From the foregoing results, it is clear that there is regular attendance by the students which has made them learn more on how to have complete mastery of mathematics as a subject leading to less number of errors. In the same way, Sebring (2007) echoes that regular attendance of classes makes it possible for students to complete mastery of Mathematics leading to less number of errors and high performance in Mathematics. In a similar, Gamoran, *et al.,* (2007) reported that students who did not have much absenteeism performed better on standardized mathematics achievement tests due to fewer errors.

Table 4.5 Absenteeism

		SD	D	UD	A	SA	Mean	Std. Dev.
Am always late in mathematics class	Frequency	97	104	7	5		1.62	0.666
	Percent	45.5	48.8	3.3	2.3			
I do not like attending mathematics class	Frequency	88	85	20	12	8	1.91	1.033
	Percent	41.3	39.9	9.4	5.6	3.8		
My peers tell not to attend mathematics class	Frequency	105	72	22	11	3	1.76	0.935
	Percent	49.3	33.8	10.3	5.2	1.4		
When we have double lesson for mathematics, I stay at home or in the dorm	Frequency	116	88	4		5	1.54	0.755
	Percent	54.5	41.3	1.9		2.3		
I rather go to another class than being in a mathematics class	Frequency	97	66	21	10	19	2	1.246
	Percent	45.5	31	9.9	4.7	8.9		

4.9 Student's Incentives

The researcher also sought to establish student's incentives. The results are presented in table 4.6. From the table, 53.5% (114) of the respondents strongly agreed that they work hard in mathematics to receive cash rewards (mean = 4.02). Further, 27.2% (58) of the respondents agreed that their class teachers have provided them with revision text books, 27.2% (58) of the respondents strongly agreed, 15.5% (33) of the respondents strongly disagreed, 26.8% (57) of the respondents disagreed and 3.3% (7) of the respondents were undecided (mean = 3.24). Finally, 9.9% (21) of the respondents agreed that they have received cash rewards for doing well in mathematics, 22.5% (48) of the respondents strongly agreed, 25.8% (55) of the respondents strongly disagreed and 35.2% (75) of the respondents disagreed (mean = 2.68). From the above findings, it is evident that students strive to perform better in Mathematics so that they can receive incentives. However, it has not been clearly established whether teachers have been able to maintain the interest that brought students to the course in the first place through providing them with revision text books and cash rewards. This clearly indicates that students learn best when incentives for learning Mathematics satisfies their own motive for enrolling in the course. Additionally, Lucas, (2000) posits that making students active participants in learning mathematics is an incentive that greatly reduces the number of errors made in mathematics.

Table 4.6 Incentives for Student

		SD	D	UD	A	SA	Mean	Std. Dev.
I have received cash rewards for doing well in mathematics	Frequency	55	75	14	21	48	2.68	1.515
	Percent	25.8	35.2	6.6	9.9	22.5		
Our class teachers has provided me with his/her revision text books	Frequency	33	57	7	58	58	3.24	1.484
	Percent	15.5	26.8	3.3	27.2	27.2		
I will work hard in mathematics to receive cash rewards	Frequency	21	19	8	51	114	4.02	1.351
	Percent	9.9	8.9	3.8	23.9	53.5		

4.10 Studying Habits

The studying habits were also sought from the students. The results are illustrated in table 4.7. From the table, 27.7% (59) of the respondents agreed that they regularly study at the same time, 35.2% (75) of the respondents strongly agreed, 13.6% (29) of the respondents strongly disagreed, 14.6% (31) of the respondents disagreed and 8.9% (19) of the respondents were undecided (mean = 4.09). Also, 33.3% (71) of the respondents agreed that they always do their homework assignments and work the problems before looking at the solutions, 35.2% (75) of the respondents strongly agreed on this statement, 17.4% (37) of the respondents strongly disagreed, 7% (15) of the respondents disagreed and 7% (15) of the respondents were undecided (mean = 3.62).

Additionally, 24.9% (53) of the respondents agreed that they choose an area where they always go to study, 36.2% (77) of the respondents strongly agreed, 11.7% (15) of the respondents strongly disagreed, 17.4% (37) of the respondents disagreed and 9.9% (21) of the respondents were undecided (mean = 3.56). As well, 23% (49) of the respondents agreed that they belong to a Mathematics study group, 38.5% (82) of the respondents strongly agreed, 15% (32) of the respondents strongly disagreed, 14.1% (30) of the respondents disagreed and 9.4% (20) of the respondents were undecided (mean = 3.56).

Likewise, 39% (83) of the respondents agreed that they regularly study at the same time, 26.8% (57) of the respondents strongly agreed, 13.1% (28) of the respondents strongly disagreed, 11.3% (24) of the respondents disagreed and 9.9% (21) of the respondents were undecided (mean = 3.55). In the same way, 26.3% (56) of the respondents agreed that they can study for at least half an hour without getting up, walking about and taking a snack or TV or phone breaks, 35.7% (76) of the respondents strongly agreed, 18.8% (40) of the respondents strongly disagreed, 7.5% (16) of the respondents disagreed and 11.7% (25) of the respondents were undecided (mean = 3.53).

Similarly, 34.3% (73) of the respondents agreed that they review major exams at least 3 days in advance, 29.1% (62) of the respondents strongly agreed, 14.1% (30) of the respondents strongly disagreed, 16% (34) of the respondents disagreed and 6.6% (14) of the respondents were undecided (mean = 3.48). Further, 30.5% (65) of the respondents agreed that they attend extra help sessions or office hours provided by mathematics teacher, 32.9% (70) of the respondents strongly agreed on the same, 17.8% (38) of the respondents strongly disagreed, 17.4% (37) of the respondents disagreed and 1.4% (3) of the respondents were undecided (mean = 3.43).

In a similar vein, 29.6% (63) of the respondents agreed that they study for Mathematics every day, 26.3% (56) of the respondents strongly agreed, 13.1% (28) of the respondents strongly disagreed, 16.9% (36) of the respondents disagreed and 14.1% (30) of the respondents were undecided (mean = 3.39). Also, 28.2% (60) of the respondents agreed that they choose an area where they always go to study, 30% (64) of the respondents strongly agreed, 18.3% (39) of the respondents strongly disagreed, 16.4% (35) of the respondents disagreed and 7% (15) of the respondents were undecided (mean = 3.35).

Moreover, 31.9% (68) of the respondents agreed that they regularly study at the same time, 22.5% (48) of the respondents strongly agreed, 13.1% (28) of the respondents strongly disagreed, 23.5% (50) of the respondents disagreed and 8.9% (19) of the respondents were undecided (mean = 3.27). Finally, 25.8% (55) of the respondents agreed that they always have enough time after taking their tests to review for calculation errors and “stupid” mistakes like misplaced + or – signs, 24.9% (53) of the respondents strongly agreed, 17.8% (38) of the respondents strongly disagreed, 17.8% (38) of the respondents disagreed and 13.6% (29) of the respondents were undecided To sum up, students study regularly and the time between classes is also used for study.

It was also established that students belong to a mathematics study group and they always do their assignments and work out problems before looking at the solutions. However, there was doubt whether students revise for major exams at least three days in advance and whether they attend extra help sessions provided by the mathematics teacher. Also, Bruno (1999) argues that studying at the same times each day makes one to have a high level of concentration thereby reducing the number of errors made in mathematics. Further, having a specific objective to accomplish during study is of essence since it brings improvement in performance and in the errors made in mathematics (Bursal & Paznokas, 2006).

Table 4.7 Studying Habits

		SD	D	UD	A	SA	Mean	Std. Dev.
I regularly study at the same time	F	28	24	21	83	57	3.55	1.34
	%	13.1	11.3	9.9	39	26.8		
I choose an area where i always go to study	F	39	35	15	60	64	3.35	1.51
	%	18.3	16.4	7	28.2	30		
I can study for at least a half hour without getting up, walking about, taking snack or TV or phone breaks	F	40	16	25	56	76	3.53	1.5
	%	18.8	7.5	11.7	26.3	35.7		
I use my time between classes to study	F	29	31	19	59	75	4.09	4.25
	%	13.6	14.6	8.9	27.7	35.2		
I study for mathematics subject every day	F	28	36	30	63	56	3.39	1.38
	%	13.1	16.9	14.1	29.6	26.3		
I review for major exams at least 3 days in advance	F	30	34	14	73	62	3.48	1.42
	%	14.1	16	6.6	34.3	29.1		
I belong to a mathematics study group	F	32	30	20	49	82	3.56	1.49
	%	15	14.1	9.4	23	38.5		
I attend extra help sessions or office hours provided by mathematics teacher	F	38	37	3	65	70	3.43	1.53
	%	17.8	17.4	1.4	30.5	32.9		
I always do my homework assignments and work the problems before looking at the solutions	F	37	15	15	71	75	3.62	1.46
	%	17.4	7	7	33.3	35.2		
I always have enough time after taking my tests to review for calculation errors and "stupid" mistakes like misplaced + or – signs	F	38	38	29	55	53	3.22	1.45
	%	17.8	17.8	13.6	25.8	24.9		
I regularly study at the same time	F	28	50	19	68	48	3.27	1.38
	%	13.1	23.5	8.9	31.9	22.5		
I choose an area where I always go to study	F	25	37	21	53	77	3.56	1.43
	%	11.7	17.4	9.9	24.9	36.2		

4.11 Students' Errors

Student errors were also established by the researcher. From table 4.8, 10.8% (23) of the respondents reported to having had 9 errors, 10.3% (22) of the respondents stated that they have had just one error, 8.5% (18) of the respondents reported that they have had 5 errors, 8% (17) of the respondents stated that they have had 6 errors, 7.5% (16) of the respondents confirmed to having had 11 errors, 7% (15) of the respondents reported that they have had 2 errors and 7% (15) of the respondents confirmed to having had 3 errors. Further, 7% (15) of the respondents reported that they had 13 errors, 7% (15) of the respondents confirmed that they had 14 errors, 6.6% (14) of the respondents stated that they had 12 errors, 6.1% (13) of the respondents stated that they had 10 errors, 4.2% (9) of the respondents affirmed that they had 4 errors and 3.8% (8) of the respondents confirmed that they had 7 errors. From the foregoing results, it is clear that all the students made errors the only difference being the number of errors made. It therefore implies that the errors made are a misunderstanding of the topic which needs to be re-taught rather than assumed.

Table 4.8 Number of Errors Reported by the Respondents

No. of Errors	Frequency	Percent
1	22	10.3
2	15	7
3	15	7
4	9	4.2
5	18	8.5
6	17	8
7	8	3.8
8	13	6.1
9	23	10.8
10	13	6.1
11	16	7.5
12	14	6.6
13	15	7
14	15	7
Total	213	100

4.12 Correlation Analysis of Student Factors Influencing the Number of Errors in Mathematics

Correlation analysis aids in the determination of the existing relationships among the study variables. In this case, the existing relationship between the independent factors and the dependent factor (students' number of errors in mathematics). The correlation did not imply a causal-effect relationship. The results were summarized and presented in table 4.9.

The correlation model illustrated indicates a significant positive relationship between student anxiety (r=0.465 and p-value=0.004 <α=0.01) and students' number of errors in mathematics. This implies that student anxiety has 46.5% positive relationship with students' number of errors in mathematics. The correlation table above also shows that there is a significant positive relationship between absenteeism and students' number of errors in mathematics (r= 0.316 and p-value=0.002 <α=0.01). This result indicates that absenteeism has 31.6% positive relationship with students' number of errors in mathematics. The relationship between student incentives and students' number of errors in mathematics indicates a significant positive relationship (r=0.427 and p-value=0.000<α=0.01). It implies that student incentives have 42.7% positive relationship with students' number of errors in mathematics. However, studying habits exhibited no significant relationship with students' number of errors in mathematics (r=0.525 and p-value=0.721). The findings are consistent with other studies which claim that test anxiety (Dornyei, 2005), absenteeism (Cobb et al., 2000) student incentives (Tsamir & Tirosh, 2003) and studying habit (Reddy, 2006) causes errors in mathematics among students.

Table 4.9 Correlation Results

		Errors	Students anxiety	Absenteeism	Student Incentives	Studying Habits
Errors	Pearson Correlation	1				
	Sig. (2-tailed)	0				
Students anxiety	Pearson Correlation	0.465**	1			
	Sig. (2-tailed)	0.004				
Absenteeism	Pearson Correlation	.316**	0.083	1		
	Sig. (2-tailed)	0.002	0			
Student Incentives	Pearson Correlation	-.427**	-0.019	-0.014	1	
	Sig. (2-tailed)	0	0.781	0.836		
Studying Habits	Pearson Correlation	0.525	0.132	0.005	-0.063	1
	Sig. (2-tailed)	0.721	0.054	0.937	0.357	

** Correlation is significant at the 0.01 level (2-tailed).

4.13 Chapter Summary

This chapter has presented descriptive statistics for demographic factors of the students, students' anxiety, study habit, incentives and absenteeism. The study has also presented correlation statistics for students' anxiety, study habit, incentives and absenteeism with students' errors. All the four factors were found to have a positive relationship with students' number of errors.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Overview

This chapter presents the summary of the findings and conclusions based on the results analyzed. Recommendations are made based on the conclusions and the chapter ends with recommendations for further studies that are deemed important for the extension of this research.

5.1 Summary of Findings

The main purpose of this study was to establish factors influencing students' number of errors in mathematics in Keiyo North, Elgeyo Marakwet County. The target population of the study was students of public secondary schools in Keiyo North, Elgeyo Marakwet County. The study was guided by research objectives and made inference on the hypotheses that test anxiety, absenteeism, incentives for learning and study habits have no significant influence on students' number of errors in mathematics. Data was collected by use of questionnaires and analyzed using descriptive statistics and it revealed the following;

5.2.1 Anxiety on Students' Number of Errors in Mathematics

As evidenced in the findings, anxiety has a positive and significant effect on students' number of errors in Mathematics. This implies that whenever students feel anxious during Math tests, the way in which they manipulate numbers and solve mathematical problems is interfered with hence they are more likely to make errors. In line with the results, Dreyden & Gallagher, (2009) state that most school-based performance measures are administered with a time limit which causes anxiety among the students leading to a lot of errors in the mathematics test. Moreover, Hopko et.al. (2003) observed that persons with mathematics anxiety make more mistakes in dealing with mathematics problems. In a similar vein, poor performance in mathematics is associated with an increase in mathematics test anxiety leading to a lot of errors and poor performance (Furner & Duffy, 2002; Hopko *et.al*, 2003).However, Lupkowski and Schumacker (2001) found no correlation between anxiety level and errors in the mathematics portion of the Scholastic Aptitude Test (SAT).

5.2.2 Class Absenteeism on Students' Number of Errors in Mathematics

Basing on findings in the previous chapter, class absenteeism positively influences students' number of errors in Mathematics. Cognate to the results, Teddlie and Reynolds (2000) state that lack of absenteeism makes it possible for students to learn more on how to cope with errors hence low amount of errors will be made in Mathematics. As such, school policies that punish absenteeism leads to less errors among students taking Mathematics (Lee, Croninger, & Smith, 2007; Luyten, 2004). Also, Gomez (2009) asserts that students with less absenteeism had fewer errors in Mathematics. From the foregoing, increasing the level of school attendance leads to improved performance in Mathematics due to reduced errors made in Mathematics.

5.2.3 Incentives for Learning on Students' Number of Errors in Mathematics

Incentives for learning were also shown to have a significant effect on students' number of errors in mathematics. In conformity with the findings of the study, Ericksen (2008) states that effective learning in the classroom brings about low amount of errors made by students' hence high performance. Further, incentives such as interest in the subject matter, perception of its usefulness, general desire to achieve and self-confidence and self-esteem reduces the amount of errors made by students in mathematics (Saxe *et al.,* 2010).

5.2.4 Study Habits on Students' Number of Errors in Mathematics

Basing on the findings, a study habit was found to have a significant effect on students' number of errors in mathematics. In agreement with the results, Arslan and Eraslan (2003) argue that poor study habits in Mathematics causes a lot of errors in the subject. As such, they find it prudent for students to space the work over shorter periods of time to be more productive and to avoid mathematical errors. Specifically, Bindak (2005) argues that having a consistent time of study contributes to higher achievement in mathematics by reducing the errors made in the subject.

5.3 Conclusion

From the findings it was undefined whether students feel unrelaxed and uneasy during mathematic examinations. As well, students were not certain whether they worry too much that other students might understand the problem better than them when the teacher is showing the class how to do a problem. However, students were scared of taking mathematics tests and they dread having to do Mathematics. In most cases, they worry too much that they will do poorly whenever the teacher says he/she is going to ask them some questions to find out if they understand the concepts in Mathematics well.

In relation to student absenteeism, students denied that they stay at home whenever they have double lesson for Mathematics. It was also noted that students are not always late in Mathematics class and their peers are not of the habit of telling them not to attend Mathematics class. Students also confirmed that they like attending the Mathematics class and they would not opt to go to another class when there is a Mathematics class since they learn more on how to cope with errors hence low amount of errors are made in Mathematics.

It was evident from the findings in the previous chapter that students work hard in mathematics to receive cash rewards. However, it was uncertain whether teachers have provided students with revision text books and if they have received cash rewards for doing well in mathematics. Further, it was not fully established whether there is a conducive learning environment that supports students' beliefs that they can do well.

As evidenced in the findings, students regularly study at the same time. In addition, they always do their homework assignments and work the problems before looking at the solutions. They also belong to a Mathematics study group. However, there was uncertainty on whether students review major exams at least 3 days in advance and if indeed they attend extra help sessions provided by the Mathematics teacher. Further, it was uncertain whether students have enough time after taking their tests to review for calculation errors.

5.4 Recommendations

It has been established from the study that anxiety has a significant effect on students' number of errors in mathematics. There is therefore need for both parents and teachers to refrain from giving students negative perceptions of Mathematics so as to reduce uneasiness and nervousness among students during Mathematics examinations. Further, it should be a collective responsibility for students to ensure that they understand well the concepts taught in Mathematics and seek assistance where they experience difficulty so as to reduce anxiety during tests which makes them commit errors.

Similarly, class absenteeism was also shown to have an influence on students' number of errors in mathematics. It is therefore necessary for students to regularly attend school so as to master the concepts in Mathematics and reduce the amount of errors. It is also imperative for schools to develop policies that strongly punish absenteeism in order for students to make fewer errors in Mathematics.

There is also evidence from the study that incentives for learning have a significant influence on students' number of errors in mathematics. As a result, it is imperative for teachers to avail revision text books to students and offer cash rewards to them whenever they exhibit exemplary performance. As well, the school needs to create an atmosphere that is open and positive and help students feel that they are valued members of the learning community. Moreover, teachers need to give positive feedback that supports students' belief that they can do well and assign tasks that are neither too easy nor difficult so as to enhance confidence in students in their ability to tackle Mathematical problems without making errors.

Finally, the results of the study affirmed that study habits have a significant influence on students' number of errors in mathematics. There is therefore need for students to have a consistent time of study. It is utmost necessary for students to do their homework assignments and work the problems before looking at the solutions. It is also necessary for students to attend extra help sessions provided by the Mathematics teacher. Moreover, students should avail enough time after taking their tests to review calculation errors.

5.5 Suggestions Research Suggestions

This study focused on factors influencing students' number of errors in mathematics in Keiyo, Elgeyo Marakwet County. It can be replicated with a larger, more representative sample. Furthermore, it would be interesting to know whether the observed findings hold for other Counties in the country as well. More research is needed in this subject area to fully establish the influence of anxiety on students' number of errors in Mathematics since most of the respondents were impartial on a number of factors pertaining anxiety for instance whether they feel unrelaxed and uneasy during mathematic examinations. Major contextual and settings to be considered in future researches should consider insights from this study influencing students' number of errors in mathematics including the four factors: anxiety; absenteeism; study habits; and incentives for learning as key factors to be considered if performance in Mathematics is to be enhanced.

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APPENDIX 1

QUESTIONNAIRE FOR STUDENTS

Dear Respondent,

I am a student at University of Eldoret carrying out a research on *"**Student factors influencing number of errors in mathematics subject. A survey of Secondary Schools in Keiyo North Elgeyo Marakwet County**"*. The research is meant for academic purpose only. You are kindly requested to provide answers to these questions as honestly and precisely as possible. The information provided will be kept **confidential**.

SECTION A: Demographic information (Tick (√) appropriately)

1. What is your Gender Male [ ] Female [ ]
2. Age bracket

   10 – 15 [ ] 16 – 20 [ ] 21 – 25 [ ] Above 26 [ ]
3. What is your class? (tick one) form 2 [ ] form 3 [ ]
4. What is the level of your parent's/guardian's level of education?

   Primary [ ]

   Secondary [ ]

   College [ ]

   University [ ]

   Other [ ]
5. What is the occupation of your mother…………….
6. What is the occupation of your father…………….
7. Indicate your general performance of mathematics examinations

   Excellent ☐ Very Good ☐ Average ☐ Poor ☐ Very Poor ☐

SECTION B: MEASURING OF STUDENTS' ERROR IN MATHEMATICS

This is **not** a test. There is no right or wrong response. You are kindly requested to give responses that are true to the best of your knowledge. The responses you give will not be disclosed at all. The questionnaire consists of items concerning pupils' class repetition. You are required to indicate whether you strongly agree (SA), or you simply agree (A) , or you are undecided (UD), or you disagree (D), or you simply disagree (SD) with each of the statement. Put a tick (√) in the box that corresponds to your feeling

	SA	A	UD	D	SD
8. When the teacher says he/she is going to ask you some questions to find out how much you know about math, I worry too much that you will do poorly					
9. When the teacher is showing the class how to do a problem, I worry too much that other students might understand the problem better than me					
10. When I am in mathematics examinations, I usually feel not at all at ease and relaxed.					
11. When I am taking math tests, I usually feel very nervous and uneasy.					
12. Taking math tests scares me. I very often feel this way					
13. I dread having to do math. I very often feel this way					
14. 7.It scares me to think that I will be taking math exam					
15. Am always late in mathematics class					
16. I do not like attending mathematics class					
17. My peers tell not to attend mathematics class					
18. When we have double lesson for mathematics, I stay at home or in the dorm					
19. I rather go to another class than being in a mathematics class					
20. I have received cash rewards for doing well in math					
21. Our class teachers has provided me with his/her revision text books					
22. I will work hard in math to received cash rewards					
23. I regularly study at the same time					
24. I choose an area where i always go to study					
25. I can study for at least a half hour without getting up, walking about, taking snack or TV or phone breaks					
26. I use my time between classes to study					
27. I study for mathematics subject every day					
28. I review for major exams at least 3 days in advance					
29. I belong to a mathematics study group					
30. I attend extra help sessions or office hours provided by mathematics teacher					
31. I always do my homework assignments and work the problems before looking at the solutions					

32. I always have enough time after taking my tests to review for calculation errors and "stupid" mistakes like misplaced + or – signs					
33. I regularly study at the same time					
34. I choose an area where i always go to study					
35. I can study for at least a half hour without getting up, walking about, taking snack or TV or phone breaks					

THANK YOU

APPENDIX II

AUTHORISATION LETTER FROM UNIVERSITY OF ELDORET

University of Eldoret
flame of knowledge and innovation

P.O. Box 1125-30100,
ELDORET, Kenya
Tel: 053-2063111 Ext. 242
Fax No. 20-2141257

Our Ref: UOE/SOE/TED/13

24th June 2014

The Executive Secretary,
National Council for Science and Technology,
P.O. BOX 30623-00100,
NAIROBI.

Dear Sir/Madam,

RE: RESEARCH PERMIT FOR-SEREM SELLY J. - EDU/PGP/1001/12

This is to confirm that the above named Post Graduate Student has completed Course work of her master of Education in Educational Psychology.

She is currently preparing for a field research work on her thesis entitled: ***"Student factors influencing the number of errors in mathematics subject. A survey of Secondary Schools in Keiyo North ,Elgeyo Marakwet County"***. The proposal has has been approved by this Institution.

Any assistance accorded her to facilitate successful conduct of the research and the publication will be highly appreciated.

Yours faithfully,

UNIVERSITY OF ELDORET
Dept. Of Technology Education
P.O. Box 1125 Eldoret 30100.

Dr. K.M. Kitainge
HEAD, TECHNOLOGY EDUCATION DEPARTMENT

Copy to: Permanent Secretary,
Ministry of Higher Education, Science & Technology,
P.O. Box 9583-00200,
NAIROBI.

APPENDIX III

RESEARCH PERMIT FROM NACOSTI

THIS IS TO CERTIFY THAT:
MS. SEREM SELLY JERUTO
of UNIVERSITY OF ELDORET, 124-30700
iten,has been permitted to conduct
research in *Elgeyo-Marakwet County*

Permit No : NACOSTI/P/14/3227/2424
Date Of Issue : 7th August,2014
Fee Recieved :Ksh 1,000

On the topic: ***"Student factors influencing number of errors in mathematics subject. A survey of Secondary Schools in Keiyo North, Elgeyo Marakwet County".***

for the period ending:
31st October,2014

....
Applicant's Signature

....
Secretary
National Commission for Science, Technology & Innovation

CONDITIONS

1. **You must report to the County Commissioner and the County Education Officer of the area before embarking on your research. Failure to do that may lead to the cancellation of your permit**
2. **Government Officers will not be interviewed without prior appointment.**
3. **No questionnaire will be used unless it has been approved.**
4. **Excavation, filming and collection of biological specimens are subject to further permission from the relevant Government Ministries.**
5. **You are required to submit at least two(2) hard copies and one(1) soft copy of your final report.**
6. **The Government of Kenya reserves the right to modify the conditions of this permit including its cancellation without notice**

REPUBLIC OF KENYA

NACOSTI

National Commission for Science, Technology and Innovation

RESEARCH CLEARANCE PERMIT

Serial No. A 2477

CONDITIONS: see back page

APPENDIX IV

RESEARCH AUTHORIZATION

NACOSTI

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone: +254-20-2213471, 2241349, 310571, 2219420
Fax: +254-20-318245, 318249
Email: secretary@nacosti.go.ke
Website: www.nacosti.go.ke
When replying please quote

9th Floor, Utalii House
Uhuru Highway
P.O. Box 30623-00100
NAIROBI-KENYA

Ref: No.

NACOSTI/P/14/3227/2424

Date:

7th August, 2014

Serem Selly Jeruto
University of Eldoret
P.O. Box 1125-30100
ELDORET.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on *"**Student factors influencing number of errors in mathematics subject. A survey of Secondary Schools in Keiyo North Elgeyo Marakwet County,**"* I am pleased to inform you that you have been authorized to undertake research in **Keiyo North Elgeyo Marakwet County** for a period ending **31st October, 2014.**

You are advised to report to the **County Commissioner and the County Director of Education, Elgeyo Marakwet County** before embarking on the research project.

on completion of the research, you are expected to submit **two hard copies and one soft copy in pdf** of the research report/thesis to our office.

SAID HUSSEIN
FOR: SECRETARY/CEO

Copy to:

The County Commissioner
The County Director of Education
Elgeyo-Marakwet County.