A STUDY OF TEACHERS' AND PUPILS' CHARACTERISTICS THAT AFFECT THE PERFORMANCE OF STANDARD EIGHT (8) PUPILS IN MATHEMATICS IN THE END OF TERM TWO EXAMINATION IN GITHUNGURI EDUCATIONAL ZONE, KIAMBU DISTRICT, KENYA

BY

SAMUEL GATHOGO IRUMBI

A RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE DEGREE OF MASTER OF EDUCATION OF KENYATTA UNIVERSITY

DECLARATION

This research project is my original work and has not been submitted for a degree in any other University.

Samuel Gathogo Irumbi

This research project has been submitted for examination with my approval as University Supervisor.

Dr. P.K. Mutunga
Senior Lecturer,
Department of Communication &
Technology,
Kenyatta University

1990

DEDICATION

This research project work is dedicated to my wife and children whose encouragement and support has been a source of inspiration.

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ABSTRACT

This study was conducted in Githunguri Educational Zone of Kiambu District, Kenya. The main purpose of this study was to identify and analyse some of the teachers' and pupils' characteristics that affect the performance of standard eight (8) pupils in mathematics in the end of term two examination. The teachers' characteristics that were considered in this study included their attitudes towards mathematics, sex, teaching experience in primary schools, academic and professional qualifications. The pupils' characteristics that were considered included their attitudes towards mathematics, sex and age. The researcher also considered other factors related to both teachers and pupils which included: the time taken by teachers to coach pupils in mathematics, class size and the availability of mathematics textbooks to pupils. The above factors formed the independent variables of this study.

The following null hypotheses were generated and tested:

(i) Pupils' performance in mathematics in the examination is not affected by: teachers' attitudes towards mathematics, teachers'

academic and professional qualifications and their teaching experience in primary schools as trained teachers.

(ii) There is no significant difference in performance in mathematics in the examination between pupils taught by teachers of different sex.

(iii) There is no significant correlation between pupils' attitudes and their performance in mathematics in the examination.

(iv) There is no significant difference in performance in mathematics in the examination between boys and girls.

(v) There is no significant difference in performance between standard eight (8) pupils of different age groups.

(vi) Pupils' performance in mathematics in the examination is not affected by: class size, availability of mathematics textbooks and the time spent by teachers in coaching pupils in mathematics. The study also attempted to find out factors which teachers and pupils considered to be crucial to good performance in mathematics in the examination.

To carry out this study, a sample of one hundred and forty one (141) standard eight (8) pupils was drawn randomly from seven (7) schools in Githunguri Educational Zone. Fourteen (14) standard eight (8) mathematics teachers from the seven (7) selected schools participated in the research. Two questionnaires; one for teachers and another for pupils were used to collect the required data. A pretest was carried out to test the reliability of the questionnaires. The results of the end of term two examination in mathematics was used as a measure of performance in mathematics. This formed the dependent variable of the study.

The main statistics that were used to test the above hypotheses included the chi-square (X^2) test, Z-statistic and the Pearson's Moment Correlation Coefficient and the t-test. Chi-square (X^2) statistic was used to test the effect of the various variables on the pupils' performance in mathematics in the examination. Z-statistic was used to test the significance of the difference in the means of different groups of pupils. Peason Moment Correlation Coefficient and t-test were used to determine the significance of correlation between pupils' attitudes towards mathematics and their

performance in mathematics in the examination.

The following were the main conclusions of this study:

(a) It was found that pupils' performance in mathematics in the examination was significantly affected by teachers' academic and professional qualifications.

(b) It was found that pupils' performance in mathematics in the examination was not affected by: teachers' attitudes towards mathematics, teachers' teaching experience in primary schools, class size and the time spent by teachers in coaching pupils in mathematics.

(c) No significant difference was found in performance in mathematics in the examination between pupils taught by teachers of different sex.

(d) No significant difference was found in performance in mathematics in the examination between the standard eight (8) pupils of different age groups.

(f) There was a significant difference in performance in mathematics in the examination between boys and girls in favour of boys.

(g) There was a significant positive correlation between pupils' attitudes towards mathematics and their performance in mathematics in the examination.

(h) It was found that majority of teachers and pupils considered the availability of mathematics textbooks, as having an effect on the pupils' performance in mathematics. They also considered lack of enough time to study and lack of interest as contributing to poor performance in mathematics in the examination.

To improve the pupils' performance in mathematics in the examination, the researcher recommended that teachers' academic and professional training should be improved. Teachers should use teaching methods which motivate and arouse interest in pupils and hence enhancing positive attitudes towards mathematics. Teachers should help pupils, particularly girls, to learn mathematics by use of teaching aids and individualized instructions. This will encourage the pupils to improve

their performance in mathematics. The researcher also recommended that, the Ministry of Education and Parents should provide the necessary textbooks, supplementary materials and equipment to all pupils in all schools in order to improve on the pupils' performance in mathematics. The researcher recommended that curriculum planners and developers should consider allocating more time to the teaching and learning of mathematics.

Finally, the researcher noted that, there is need to replicate this study to cover a bigger area with more schools, pupils and teachers. This would help to ratify the findings of this study. It was also recommended that more research be undertaken on other factors which are likely to affect the pupils' performance in mathematics.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Mathematics is considered to be a key curriculum subject in many countries of the world. Its importance is strongly expressed by the Cockcroft Committee report of 1982 which observed that:

> There can be no doubt that there is general agreement that every child should study mathematics at school; indeed, the study of mathematics... is regarded by most people as being essential.[1]

The usefulness of mathematics to the child and the society can be perceived from very many different perspectives. Mathematics has a primary duty of serving the goals of education in a country. In this respect, mathematics is strategically placed to enhance individual development and self-fulfilment by providing opportunities for the fullest development of individual talents and personality. It is also strategically placed to enhance national development by equipping the youth of the country with skills, knowledge and expertise. To effectively facilitate these roles, mathematics is fundamental to the study of the physical sciences, engineering of all kinds, medicine, biological sciences, business and management studies, geography and economics. Indeed, the

study of mathematics has proved to be very essential to technological, scientific, commercial and industrial development of modern society.

Mathematics plays a key role in the communication of information and ideas. It can be used to communicate ideas by use of figures, letters, tables, charts, graphs, diagrams and even geometrical diagrams. It is also quite useful for the development of logical thinking, accuracy and spatial awareness. These are essential ingredients in the mental development of man and there is need to promote their development.

Due to its overall importance in the various aspects of life, mathematics is a basic requirement for the study of several subjects at secondary school level, courses at universities, teacher training colleges, other training institutions and in several employment sectors. This has necessitated mathematics to be made a compulsory and examinable subject in Kenyan primary schools. However, in spite of its importance in the various aspects of development, performance in mathematics in national and local examinations has not been impressive. A lot of concern has been expressed by parents, teachers, pupils, edu-

cational administrators, politicians and the general public.

Mwangi (1986) noticed this and commented that:

> There has been an outcry from the government and the general public on the way students learn and perform mathematics.[2]

Similar sentiments were expressed by Kiragu (1986) who observed that:

> Despite national efforts made in developing a curriculum that is appropriate to the needs of this country, coupled with teacher training efforts, performance in the Kenya Certificate of Education has been relatively poor over the last 10 years or so and particularly in mathematics.[3]

The remarks by Mwangi (1986) and Kiragu (1986) indicate that the performance in mathematics in national examinations like Kenya Certificate of Primary Education (KCPE) and Kenya Certificate of Secondary Education (KCSE) has not been as expected by the public and the government. In fact Mukasa Mango (1987), while addressing Parliament in Kenya called for a probe into mathematics due to poor performance by the students in the national examinations in Kenya.[4]

A focus on the performance in mathematics in Kenya Certificate of Primary Education from 1985 to 1988 indicates a sharp decline between 1985 to 1987, with only a slight improvement in 1988. The data, showing the mean scores in mathematics at KCPE from 1985 to 1988 are presented in the table below.

TABLE 1.1
KCPE Mean Scores from 1985 to 1988 (Mathematics)

YEAR	1985	1986	1987	1988
Mean Score	50.44	43.93	40.64	44.46

Source: Kenya National Examinations Council (KNEC), KCPE Newsletter, 1989, p. 65.

The causes of this decline coupled with poor performance in KCPE mathematics in general remains unclear to all those concerned with education in Kenya. At district level, a similar trend can be observed in Kiambu District of Kenya. There has been a gradual decline in mathematics performance in KCPE from 1985 to 1987 with only a slight improvement in 1988 and 1989, as shown by the Table 1.2.

TABLE 1.2

KCPE: Mean Scores for Kiambu District from 1985 to 1989 (Mathematics)

YEAR	1985	1986	1987	1988	1989
Mean Score	52.24	51.77	51.45	52.47	52.11

Source: Kiambu District Education Office (DEO), Kenya 1990.

The performance in mathematics in Kiambu is better when compared to the national performance, but when compared to the performance of the other districts of the same province it is one of the poorest, as shown by the table below.

TABLE 1.3

KCPE: Mean Scores for Central Province for 1988 (Mathematics).

DISTRICT	NYANDARUA	NYERI	KIRINYAGA	MURANGA	KIAMBU	THIKA
1988 Mean Scores in Mathe-matics.	58.00	56.37	58.10	56.01	52.47	51.58

Source: KNEC, KCPE Newsletter, Nairobi 1989 p. 162·

Githunguri educational zone, is one of the three educational zones of Githunguri Division of Kiambu District. This educational zone had the lowest mean score in Githunguri division and in fact its performance in mathematics was below the district performance in 1989 KCPE. Githunguri educational zone had a mean score of 51.87 in mathematics, while the other educational zones Komothai and Githiga had 53.60 and 54.23 respectively.

The causes of this relative poor performance in mathematics in Githunguri educational zone has not been fully identified to allow for solutions to be found. Due to this situations, we find that at the beginning of every year when the KCPE results are out, the various interested parties result in apportioning blame to each other. There is a tendency for parents, pupils and administrators to blame the teachers for poor quality teaching. Teachers are accused of adopting a 'relaxed attitude' towards their work. There are also complaints that, some teachers regard teaching as a job which they simply do to earn a living and they have no real love for it. These accusations may result in low morale and a negative

attitude towards the teaching of mathematics in particular.

Teachers, parents and educational administrators may also blame pupils for not taking their studies seriously. This may also result in low morale and negative attitudes towards mathematics. Similarly teachers and pupils have a tendency to blame the parents, schools and other educational administrators for lack of the much needed facilities like textbooks, classrooms and even desks. It needs be mentioned here that, the provision of educational facilities is directly related to the policy of financing education in Kenya. It is also generally accepted that the provision of educational facilities is an important determinant of the quality of education. The National Development Plan for the period 1989 to 1993 has underlined the fact that, the parents and the beneficiaries of education and training will on their part meet the cost relating to the development and provision of educational facilities and equipment.[5] This may indicate that school facilities will be a joint responsibility of parents and the Ministry of Education. The extent to which these facilities are provided will definitely affect the quality of education

and hence the performance of pupils in mathematics in both local and national examinations.

From the above, it can be observed that the performance in mathematics may be affected by factors related to teachers, pupils, society and environment. These factors are all involved in the process of learning mathematics and hence are likely to contribute to the performance in mathematics. However, the effect of these factors on performance is not fully understood. For example, Begle (1973) observed that we do not know how to identify in advance those teachers who will be effective or not, and he explains that we can only identify the effective teachers after examinations.[6]

The role of assessment cannot be underrated. Primary schools in Kenya are engaged in a variety of assessment methods. Teachers are expected to continuously give written and oral exercises and tests. They are also expected to make constant observations of pupils' work and assess it. All these activities are aimed at monitoring the progress of pupils. In the same spirit, the local education office is also engaged in organizing a series of examinations that are set, marked and processed centrally. However,

although these examinations are intended to increase validity and reliability by being organized centrally, they still suffer from some weaknesses. The teachers who set, moderate and mark these examinations do not have any special training, and hence the problems of lack of validity and reliability still exist. Some teachers set these examinations to suit their schools by testing only what they have covered.

Nevertheless, the main purpose of these examinations of monitoring the progress of pupils and their schools is achieved to some extent.

1.2 Statement of the Problem

This study was intended to identify and analyse some of the teachers' and pupils' characteristics that affect the performance of standard eight (8) pupils in mathematics in the end of term two examination in Githunguri educational zone in Githunguri Division of Kiambu District, Kenya. To facilitate the analysis, the researcher considered the performance of pupils in the end of Term Two Kiambu District Examination in mathematics which was done in July, 1990. This is an examination which was set for all the standard eight (8) pupils in Kiambu District. It was set, marked and processed centrally to improve

and monitor the progress of standard eight (8) pupils.

The researcher felt strongly that, some of the teachers' characteristics like their attitudes towards mathematics, sex, academic qualifications, professional grade and teaching experience as trained teachers in primary schools might influence the performance of pupils in mathematics in the examination. Similarly, the researcher felt that, pupils' characteristics like their attitudes towards mathematics, age and their sex might also affect their performance in mathematics.

The researcher also considered the class size, the availability of mathematics textbooks and the time spent by teachers in coaching pupils in mathematics. These factors were considered to be closely related to pupils and teachers. An attempt was made to deal with quantifiable variables, although several other possible variables were left out due to time and financial constraints on the project.

The end of term two examination in mathematics was used as a dependent variable, while the various teachers' and pupils' characteristics were used as independent variables for the study. The use of the

end of term two examination was based on the fact that, it is one of the main examinations administered to all standard eight (8) pupils in Kiambu District and hence to all the standard eight (8) pupils in Githunguri educational zone. Therefore this examination was used for comparison in Githunguri educational zone, where the research was based. It was expected that this examination would test most of the work covered in the Kenya Certificate of Primary Education and hence give a reflection of pupils' performance in mathematics in standard eight (8). However, it can still be noted that a section of the KCPE syllabus may not have been tested in this examination due to lack of syllabus coverage. This is because this examination was administered at the end of second term, and hence there was still one more term of work to be covered.

1.3 Objectives of the Study

This study was to investigate teachers' and pupils' characteristics that affect the performance of standard eight (8) pupils in mathematics in the end of term two examination in Githunguri educational zone. The study aimed to accomplish the following objectives:

1. To find out:

   i) the effect of teachers' attitudes towards mathematics on the pupils' performance in mathematics in the examination.

   ii) the effect of teachers' academic qualifications on the pupils' performance in mathematics in the examination.

   iii) the effect of teachers' professional grade (certificate) on the pupils' performance in mathematics in the examination.

   iv) the effect of teachers' experience as trained teachers in primary schools on the pupils' performance in mathematics in the examination.

2. To find out whether there is a significant difference in performance in mathematics in the examination between pupils taught by male teachers and those taught by female teachers with everything else being equal.

3. To find out the relationship between pupils' attitudes towards, and their performance in mathematics in the examination.

4. To find out whether there is a significant difference in performance in mathematics in the examination between boys and girls.

5. To find out whether there is a significant difference in performance in mathematics in the examination between standard eight (8) pupils of different age groups.

6. To find out:

   i) the effect of class size on the pupils' performance in mathematics in the examination.

   ii) the effect of mathematics textbooks used in schools on pupils' performance in mathematics in the examination.

   iii) the effect of time spent by teachers in coaching pupils in mathematics on pupils' performance in mathematics in the examination.

7. To find out other factors which teachers consider to be crucial to good performance in mathematics by pupils.

8. To find out other factors which pupils consider to be crucial to their performance in mathematics.

1.4 Hypotheses of the Study

The following hypotheses were generated and tested:

1. Pupils' performance in mathematics in the examination is not affected by:

   i) teachers' attitudes towards mathematics.

   ii) teachers' academic qualifications.

   iii) teachers' professional grade (certificate).

   iv) teachers' experience as trained teachers in primary schools.

2. There is no significant difference in performance in mathematics in the examination between pupils taught by male teachers and those taught by female teachers with everything else being equal.

3. There is no significant correlation between pupils' attitudes and their performance in mathematics in the examination.

4. There is no significant difference in performance in mathematics in the examination between boys and girls.

5. There is no significant difference in performance in mathematics in the examination between standard eight (8) pupils of different age groups.

6. Pupils' performance in mathematics in the examination is not affected by:

   i) class size.

   ii) availability of mathematics textbooks.

   iii) time spent by teachers in coaching pupils in mathematics.

1.5 Significance of the Study

Mathematics is an important subject in Kenyan primary schools and it has become a major determinant of the future careers to be undertaken by pupils. Performance in mathematics by pupils in national and local examinations causes a lot of concern among the parents, teachers, pupils, schools and other educational administrators in Kenya.

This study was to identify and analyse some of the teachers' and pupils' characteristics that are likely to affect the pupils' performance in mathematics. This study is particularly useful to the school and educational administrators, pupils, teachers and

parents in Githunguri educational zone in solving the problems of poor performance in mathematics. Although the findings may be limited in generalizations, they will be useful to teachers, pupils and curriculum developers in Kiambu District and Kenya in general. The findings will act as a pointer to the factors that affect the pupils' performance in mathematics.

Finally the findings of this study can be used to suggest the causes of poor performance in examinations in general.

1.6 Limitations of the Study

This study was limited by a number of factors. First, it was based only on one educational zone in Githunguri Division due to limited funds and time.

A second limitation is that, the study was based on standard eight (8) pupils. The choice of these pupils was due to the fact that they have covered most of the KCPE syllabus and that the various characteristics that have been considered in this study have already taken effect on them. It is particularly con-

sidered that at this level, their attitudes towards mathematics have stabilized. Therefore the use of standard eight (8) pupils only, limited the generalization.

It is also to be noted that the study is based on mathematics only. A wider coverage of other subjects in primary schools was also not feasible due to limited time and finance. Related to this limitation is that, the study dealt with a limited number of teachers' and pupils' characteristics that affect pupils' performance in mathematics. The researcher feels that there may have been a host of other factors that affect performance in mathematics. Hence the factors that have been studied here are not the only ones that affect performance in mathematics.

Finally, it is normally difficult to get honest responses particularly on the attitudes. There is a tendency for the respondents to try to impress the researcher by giving positive attitudes only and trying to conceal the unfavourable attitudes.

1.7 Assumptions of the Study

The following assumptions were made in this research:

i) that the end of term two examination for 1990 was well set, moderated, administered, marked and processed.

ii) that the pupils in this research would give honest responses.

iii) that the teachers involved in this research would give honest responses.

iv) that all the schools in the zone had a uniform and adequate coverage of the syllabus which was examined by the end of term two examination.

v) that the end of term two examination covered most of the content expected of these pupils.

vi) that the examination did not have irregularities which favoured a particular group of pupils.

vii) that there were no intervening variables when the pupils were doing the examination.

1.8 Definition of Terms

Educational Zone - This is an educational unit with about 30 or less primary schools. Educational zones are designed to facilitate educational activities like assessment and evaluation.

Coaching - This refers to tutoring of pupils for the purpose of preparing them for examination.

Class Size - This represents the number of pupils put together in one class for the purposes of teaching.

K.C.P.E. - Abbreviation for Kenya Certificate of Primary Education. It is an examination done after eight (8) years of primary education in Kenya. Other examinations of the same level which were offered previously include Kenya African Preliminary Examination - KAPE (offered after 8 years) and Certificate of Primary Education - CPE - (offered after 7 years).

KJSE - Abbreviation for Kenya Junior Secondary Examination done after two (2) years of secondary education in Kenya. It is now defunct.

K.C.S.E - Abbreviation for Kenya Certificate of Secondary Education. It is an examination done after 4 years of secondary education in Kenya. Other equivalent examinations include ordinary level London General Certificate Examination (GCE), East African Certificate Examination (EACE) and Kenya Certificate of Education (KCE), all were offered after 4 years of secondary education.

KACE - Abbreviation for Kenya Advanced Certificate of Education. This was an examination offered in Kenya after six (6) years of secondary education. It is now defunct. Other equivalent examinations include, London Advanced General Certificate Examination (GCE), East African Advanced Certificate of Education (EAACE), all were offered after six (6) years of secondary education.

End of Term Two Examination - This is a district examination organized at the end of term two for all standard eight (8) pupils in Kiambu District.

Professional Grade - Refers to professional level of attainment or qualification. It also refers to teachers professional certificate e.g. P1, P2, P3, S1 etc professional grades.

P1 - This refers to 'Primary one' which is a professional grade attained after two (2) years of training in a teachers' training college. Other professional grades are:

P_2 - 'Primary two'

P_3 - 'Primary three'

P_4 - 'Primary four' - This is the lowest grade in primary school level.

S1 - This is a professional grade which refers to 'secondary one'. It used to be attained after three years of training in a teachers' college. However, it is now a professional grade which a primary school teacher of P1 level may be promoted to.

Approved Teachers Status (ATS) - This is the highest promotional grade for a primary school teacher. A teacher may be promoted from S1 to ATS.

Mathematics Textbook - This refers to a commonly used standard book for the study of mathematics in a given class.

FOOTNOTES

1. Cockcroft W.H., Mathematics Counts, Report of the Committee of Inquiry into the Teaching of Mathematics in School. London, 1982, p. 1.

2. Mwangi D.T., "Factors Influencing the Performance and Learning of Mathematics Among Secondary School Students in Kenya." KERA Research Report, BER, Kenyatta University, Nairobi, 1986, p. 2.

3. Kiragu F.W., "Achievement in Mathematics: An Investigation of the Factors that Contribute to Mass Failure in KCE Mathematics." BER Seminar Paper No. 20124, Kenyatta University, Nairobi, Dec. 1986, p. 2.

4. Mukasa Mango, "Call for Probe into Mathematics and English, in the Standard Newspaper, July 16, 1989 Column 2-5.

5. Ministry of Finance, Kenya National Development Plan 1989 to 1993, G.P. Nairobi, p. 212.

6. Begle E.G., "Some Lessons Learned By SMSG" Mathematics Teacher 1973, Vol. 66 No. 33, pp. 207-214.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Introduction

A number of studies have been conducted by different researchers to identify and analyse factors that influence performance of pupils in mathematics and in national examinations in general.

Heynemen (1976), who studied the relations between teachers' characteristics and differences in academic achievement among Ugandan primary schools considered such characteristics as attitude, sex, amount of schooling and teachers' grade, teaching experience and teachers' parental education. In another study of factors influencing performance among primary and secondary schools pupils in western province of Kenya Eshiwani (1983) considered school, social and environmental factors.

In an international study of achievement in mathematics, Husen (1967) considered the relationship between achievement and schools' teachers' and pupils' characteristics and socio-economic factors. Other notable studies on factors affecting performance of mathematics include those by Begle (1973) and Callahan (1971).

We have also a number of studies conducted in Kenya in the same area. Kibanza (1980) in his study on some factors associated with performance in mathematics among form two pupils in Kenya considered such factors as pupils' sex, attitude towards mathematics, future plans (or aspirations) as well as their socio-economic backgrounds.

Mwangi (1986) studied factors influencing the performance in and learning of mathematics among secondary school students in Kenya. His extensive study considered factors in the following categories:

i) Characteristics of mathematics teachers which included their sex, experience, academic qualifications, professional training, inservice courses attended, frequency of supervision, degree of freedom given to teachers to innovate, extent of specialization, time spent on preparation, availability and use of teaching aids team teaching and group work.

ii) Student background which included the sex of the student, education level of parents, place of residence, influence of signifi-

cant others, student education aspirations and expectations, time devoted to homework in mathematics, attitudes towards mathematics, aspirations and expectations to take more mathematics at higher level.

iii) School characteristics which included school size, average class size, adequacy of facilities for mathematics instruction, stability of mathematics teachers and subject specialization.

Riungu (1988) studied factors that influence performance in zonal mathematics evaluation examination by standard seven pupils in township educational zone of Gachoka Division of Embu District. In his study, he compared the performance of rural and urban schools in Gachoka Division by considering the influence of such factors as teachers' attitude, sex, professional qualification, teaching experience and age. He also considered the influence of the pupils' attitudes towards mathematics and their sex to the performance in mathematics.

From all the above research studies, the factors related to teachers, pupils, schools and social back-

grounds have formed the basis of the studies of factors that affect performance in mathematics. However, the findings from these studies and others conducted elsewhere in the world seem to be at variance. The researcher intended to study the effect of some of the teachers' and pupils' characteristics that affect performance in mathematics. However this research also considered the class size, availability of mathematics textbooks and the time spent by teacher in coaching pupils as factors closely related to teachers' and pupils' characteristics.

In summary the researcher attempted to review the following literature.

i) Definition and discussion of attitudes.

ii) The effect of pupils' attitudes towards mathematics on their performance in mathematics.

iii) The effect of teachers' attitudes towards mathematics on pupils' performance in mathematics.

iv) The effect of pupils' sex on their performance in mathematics.

v) The effect of teachers' sex on pupils' performance in mathematics.

vi) The effect of pupils' age on pupils' performance in mathematics.

vii) The effect of teachers' academic and professional qualifications on pupils' performance in mathematics.

viii) The effect of teaching experience on pupils' performance in mathematics.

ix) The effect of class size on pupils' performance in mathematics.

x) The effect of availability of mathematics textbook on pupils' performance in mathematics.

xi) The effect of time spent by teachers in coaching on the pupils' performance in mathematics.

2.2 Definitions and Discussion of Attitudes

It can be noted that attitudes are very important to learning of mathematics. Attitudes largely determine what pupils learn in mathematics. They may enhance or hinder the learning of mathematics. Attitudes refer to how one thinks, feels about, and

acts toward objects or ideas. In this connection then, attitudes will definitely affect our ways of learning mathematics. It is also very important that mathematics teachers understand the attitudes of their pupils towards mathematics because by so doing, they will help them to develop positive attitudes towards mathematics. Before we discuss the effect of attitudes on the performance in mathematics, it is imperative to understand fully what attitudes are:

Keil (1985) defines attitudes as:

> Positive or negative feelings that an individual holds about objects, persons or ideas.[1]

From this definition attitudes are mental suppositions that express the connections between situations and desired ways of regarding those situations. For example a child who expresses that mathematics is an important and useful subject which should be taught in school is in effect expressing a relationship between mathematics and how people regard it as a school subject. Bell (1980), quoting Allport has defined attitude as:

> a mental and neural state of readiness, organized through experience, exerting

> a directive or dynamic influence upon the individual's response to all objects and situations with which it is related.[2]

From these definitions, attitudes can be seen to be learned and not innate, they can also be modified by experience and or persuasion. Hence, it should be possible for teachers to change the pupils' attitudes. As noted earlier, attitudes can be regarded to be predispositions to actions, for example a child who likes mathematics is likely to spend most of his time studying mathematics, while a child who dislikes mathematics will avoid studying mathematics. Finally it can be argued that since attitudes affect the learning of mathematics, it is possible that they will consequently affect pupils' performance in mathematics. Teachers, then have a duty to develop in pupils positive attitudes towards mathematics.

2.3 The Effect of Pupils' Attitudes Towards Mathematics on their Performance in Mathematics

A number of studies have attempted to establish a relationship between pupils' attitudes towards mathematics and their performance in the subject. Callahan (1971) observed that:

> Pupils' feelings are very important and have a strong effect upon the amount of work, the effort put forward, and the learning that is acquired.

This means that positive attitudes are very important to the learning of mathematics because they determine the amount of effort to be put forward, and consequently affect the performance in mathematics. To emphasise the effect of attitudes on learning Begle (1973) has noted that the pupils' attitudes towards mathematics are considered by many to be of great importance, either as educational outcomes of intrinsic importance or as determinants of mathematical achievement.

Begle (1973) observed that students attitudes towards mathematics is positive in the early years of primary schooling but a decline appears as they progress to upper classes. It can be noted that at upper primary classes teachers should sustain positive attitudes towards mathematics for better performance in the subject. The effect of these attitudes on performance in mathematics is an important aspect to this study. Kibanza (1980) found that pupils' scores on the attitudes towards mathematics correlated significantly with pupils' achievement scores in mathematics at 0.01

and 0.05 level.

Okech (1982) reporting Aiken noted that there is a modest positive relationship between attitudes and achievement in elementary school mathematics. Mwangi (1986) observed a very significant relationship between attitude towards mathematics as a process, enjoyment of mathematics and performance in mathematics. However he found no significant relationship between attitudes about the difficulty in learning of mathematics, attitude about the place of mathematics in the society and attitude towards mathematics teaching. Overall, in his findings he noted that even those who had negative attitude performed well in mathematics. Ogoma S.O (1987) in his study of relationship between achievement and attitudes towards mathematics among standard seven (7) pupils in Nairobi found that attitudes towards mathematics and achievement were positively correlated. However the magnitude of the correlation was found to be statistically insignificant.

From the above studies, it can be noted that, there is a correlation between pupils' attitudes and their performance in mathematics but the extent or

degree of correlation is not agreed upon.

2.4 The Effect of Teachers' Attitudes Towards Mathematics on Pupils' Performance in Mathematics

Teachers' attitudes are believed to be an important factor in determining the teaching and learning of mathematics. If teachers' attitudes are negative towards mathematics, this will in turn affect the pupils' learning and hence their performance in mathematics.

Cockcroft (1982) noted that:

> There is no area of knowledge where a teacher has more influence over the attitudes as well as the understanding of his pupils, than he does in mathematics. During his professional life, a teacher of mathematics may influence for good or ill the attitudes to mathematics of several thousand young people, and decisively affect many of their career choices.[4]

This indicates that teachers' attitudes towards mathematics have greater impact on mathematics than in any other area of knowledge.

Okech (1986) reporting the findings of Phillip found that teachers' attitudes towards arithmetic is

significantly related to the students' attitude and achievement. Mwangi (1986) had similar findings when he found that teachers' negative attitude was being reflected in the students' poor performance in mathematics.

In view of the above, this research attempted to confirm or reject these findings.

2.5 The Effect of Pupils' Sex on their Performance in Mathematics

All girls and boys study mathematics in our primary schools and they are expected to perform equally well. A number of studies have been conducted to investigate whether there is sex difference in their performance in mathematics.

Kibanza (1980) found that there were significant sex differences in achievement in mathematics in favour of boys at the higher cognitive levels while at lower cognitive levels, no significant sex differences were found at 0.01 and 0.05 levels of significance.

Cockcroft (1982) quoting similar findings by Fennema who conducted her research in USA with children

of ages between ten (10) and fourteen (14) in 1974, stated that:

> Girls performed better than did boys in the least complex skills (computation).. in the 77 tests of more complex cognitive skills (comprehension, application and analysis) five tests had results that favoured girls, while 54 tests showed significant differences in favour of boys. The conclusion is inescapable that the boys of these population learned the mathematics measured by these tests better than did the girls.... in overall performance on tests measuring mathematics learning ... there is no significant differences that consistently appear between the learning of boys and girls in the fourth to ninth grade ... if a difference does exist, girls tend to perform better in tests of mathematical computation, and boys tend to perform better in tests of mathematical reasoning.[5]

Although these findings show that boys are better in higher cognitive levels while girls are better than boys in lower cognitive levels, it can be deduced that boys are generally better than girls in mathematics.

Mwangi (1986) indicated that the sex of the student was significantly related to performance in mathematics in favour of boys. However this finding was biased towards the age bracket of between 16-18 years. Although pupils in this age bracket were mainly in secondary schools, a few of these are pupils in

primary school level.

Samumkut (1987) found there was a significant sex difference in performance between boys and girls of standard eight in favour of boys. However his research was undertaken at Narok where there may have been more emphasis on the education for men than women.

Riungu (1988) found no significant sex difference in mathematics performance by standard seven pupils. In an earlier study by Husen (1967), on international study of achievement in mathematics, it was found that boys in most countries perform better than girls on both verbal and computational problems which was noted to be contrary to what might be suggested from consideration of differences in verbal and numerical abilities.

Although this area of sex differences in achievement in mathematics has been a field of great deal of research work, there do not seem to be conclusive findings. The sex differences may be due to the age of the pupils, their culture or due to other factors. Hence the research findings may vary from country to country or from one educational level to

another. This research was based on primary school pupils in an attempt to determine whether there is sex difference in mathematics performance.

2.6 The Effect of Teachers' Sex on Pupils' Performance in Mathematics.

Primary school teachers are all trained to teach all subjects, including mathematics irrespective of their sex. Both male and female teachers are all expected to be competent enough to teach mathematics at all levels. However a few studies conducted have shown there could be a difference in performance between pupils taught by male teachers and those taught by female teachers.

A study by Mwangi (1986) found that students taught by male teachers showed better performance in mathematics than those taught by female teachers. However this study was done with secondary school pupils and teachers. A study by Riungu (1988) on standard seven (7) pupils found that, there was a difference in performance in favour of the male teachers in rural areas. However, there was only one female teacher involved in the study. It was found necessary to investigate the effect of the teachers'

sex on the performance of pupils in mathematics.

2.7 The Effect of Pupils' Age on Pupils' Performance in Mathematics

In each country there are specific regulations specifying when 'normal' children (i.e excluding such children as extremely mentally retarded etc) should enter school. In Kenya, the entry age is six years, however this regulation is not strictly enforced since you can find some pupils starting school even when they are four years old. It is also possible to find some pupils who remain in school for too long and hence the age range at standard eight (8) may be quite wide.

The findings of Piaget and Bruner are worthy mentioning at this stage. Piagets holds the view that a child must be 'ready' to learn any given concept, and that, readiness to learn depends on the child's stage of development. However in contrast, Bruner holds the view that any child at any stage of development can effectively be taught any subject in some intellectually honest form.

The researcher therefore intended to look at the effect of being in school for too long according

to age range of the pupils on their performance in mathematics.

2.8 The Effect of Teachers' Academic and Professional Qualifications on Pupils' Performance in Mathematics

One of the most important resources for good mathematics teaching is an adequate supply of competent mathematics teachers. Normally, the competency of teachers is classified in terms of their academic and professional qualifications. However we need to be aware that the teacher who is qualified on paper is not necessarily effective in the classroom as a teacher of mathematics, in fact, a teacher who has little or no sound qualifications in mathematics may teach mathematics better. However the significance of teachers' academic and professional qualifications cannot be overlooked.

Kiragu (1986) reporting Husen (1978) observed that in the developing world, research evidence shows that trained teachers do make a difference and in particular, she adds, teachers' qualifications, experience and amount of education and knowledge are positively related to student achievement. Teachers

in primary schools in Kenya are of different academic backgrounds, some are of KCPE, KJSE, KCE or KACE level. Similarly these teachers have achieved different professional grades, for example some are P1, P2, P3, etc. It is necessary to find out the effect of the various academic and professional qualifications on pupils' performance in mathematics.

2.9 The Effect of Teaching Experience on Pupils' Performance in Mathematics

Teaching experience is frequently included as a variable in educational research, but no clear picture of its effects seem to emerge.

Barnes (1985) observed that in longitudinal studies conducted by Fuller and Felder, which documented stages in the development of teachers and focussed particularly on their concerns, suggest that teacher effectiveness, while it may increase through the early years of teaching career, probably does not continue to do so. He asserts, that, it certainly does not do so in a linear fashion. He notes that, as suggested in a substantial proportion of the studies, increases in teaching experience, at least after the early years in the classroom, are associated with a tendency for teachers to reject innovations

and alterations in educational policy. The researcher therefore wanted to find out the effect of teaching experience on pupils' performance in mathematics.

2.10 The Effect of Class Size on Pupils' Performance in Mathematics.

The class size is a variable which at first sight seems likely to produce substantial differences in instructional outcomes. Teachers in general have been pressing for smaller classes in order that each pupil might be given more of the teachers' time. Individual differences among children is a factor which need to be considered by teachers in their teaching of mathematics. Teachers have often made attempts to individualize instruction on the belief that different instructional procedures are optimal for different pupils. In this respect, it is felt that, it is possible for teachers to give individual attention to their pupils in smaller classes than in bigger ones.

Husen (1967) found that in majority of cases, size of class is not related to mathematics achievement; however in some cases there are significant differences in scores between students from larger and smaller classes depending on the educational

system, and educational level. Begle (1973), reporting the findings of school mathematics study group (SMSG) noted that, it was more advantageous to have small size class for elementary school students while it was also more advantageous to have larger class size at the Junior High School level. In this research, there were two classification of classes, a smaller class had less than 30 pupils while a larger class had greater or equal to 30 pupils. The findings of SMSG seems to be in agreement with the view that, for a smaller class, it is possible for a teacher to individualize instructions. It is worthy to note that, there is no consensus on the number of pupils who should make up a small or large class.

In this study the researcher intended to find out the effect of class size on pupils' performance in mathematics.

2.11 The Effect of Availability of Mathematics Textbooks on Pupils' Performance in Mathematics.

Textbooks are considered to be quite useful to both teachers and pupils. Mutunga and Breakell (1987) noted that:

> The major function of a properly prepared and written textbook is that of determin-

> ing what mathematics topics are to be taught, how they are taught and at what times. The textbook, therefore, determines the scope, sequence, and pace of mathematics programme[6]

In this respect a textbook is an improtant guide for the teacher during his teaching. Mutunga and Breakell (1987) continue to note that, a textbook should:

> Provide adequate exercises for pupils which are necessary for masterly of concepts and skills.[7]

Research surveys conducted in different parts of the country, notably by Eshiwani (1983), Munguti (1984) and Muhandik (1984) indicate that the supply and availability of textbooks is highly inadequate in Kenyan primary schools. Kiragu (1986) noted that the evidence of a relationship between the provision of books and achievement is clear and consistent. She notes that the relationship between achievement and availability of textbooks is more consistent than that between achievement and other variables such as teachers' training, class size, facilities etc.

The researcher felt that, in view of the importance of textbooks to teachers and pupils, their availability is likely to be reflected in the pupils' performance in mathematics. The researcher therefore

intended to look at the effect of the availability of textbooks on pupils' performance in mathematics.

2.12 The Effect of Time Spent by Teachers in Coaching on the Pupils' Performance in Mathematics.

Schools have coaching sessions for their pupils in an attempt to improve their performance in mathematics. However, there is a great variation among schools in the amount of time spent by teachers in coaching pupils during school sessions and school holidays. Some school authorities believe that, the amount of time spent in coaching pupils by different schools has a significant effect on their performance in mathematics. This research was therefore undertaken to confirm or reject the foregoing statement.

FOOTNOTES

1. Keil L.K., in The International Encyclopedia of Education Vol. I, Preface A-B, New York, Pergamon Press, 1985, p. 352.

2. Bell F.H. Teaching Elementary School Mathematics. Dubuque Iowa; WMC Brown Company Publisher, 1980, p. 80.

3. Callahan W.J. "Adolescent Attitudes Towards Mathematics" Mathematics Teacher, 1971, Vol. 66 No. 4, pp. 751-755.

4. Cockcroft W.H. Mathematics Counts, Report of the Committee of Inquiry Into the Teaching of Mathematics in School, London, 1982, p. 188.

5. Ibid., p. 279.

6. Mutunga P.K. & Breakell J. Mathematics Education (Ist Edition) Nairobi: Kenyatta University 1987, p. 234.

7. Ibid. p. 234.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

The data required for this research was collected from primary schools in Githunguri educational zone, Githunguri Division of Kiambu District. The subjects of the research were standard eight (8) pupils and their mathematics teachers.

This chapter is divided into five sections. The first section describes the sample that was used in the research and how it was selected. The second section describes the instruments that were used to measure the variables that were considered in this study. The third section describes the pretesting procedure that was followed. The fourth section describes the scoring methods used in the attitude scales. The final section describes the procedures used for data collection in this study.

3.2 Sample

Githunguri educational zone is one of the three educational zones of Githunguri Division of Kiambu District. The zone has eighteen (18) primary schools,

however only fourteen (14) of these primary schools are currently operating up to standard eight (8). These fourteen (14) primary schools were found to be of different sizes. It was found necessary to include schools of different sizes in the research. The inclusion of schools of different sizes ensured a fair representation of all pupils in the zone.

These fourteen (14) schools were categorised as follows:

A - Schools with only one (1) standard eight (8) stream. There were six (6) schools in this category.

B - Schools with only two (2) standard eight (8) streams. There were six (6) schools in this category.

C - Schools with five (5) standard eight (8) streams. There were two (2) schools in this category.

To select schools from each category a random sample was taken. Harper (1989) notes that the possibility of taking a sample having unsuspected bias can

be reduced by taking a random sample.[1] This is because a random sample is selected in such a way that every item in the population has an equal chance of being included. Lindgren (1981) observes that in taking a random sample, there is a good chance of producing a sample that represented the population in every characteristic.[2] Dowdy (1983) has also noted that, a random sample will be the best to represent the entire population when it is not feasible in terms of time and cost to study the entire population.[3] Hence taking a random sample was found appropriate to this study.

The method of selection was as follows; the researcher folded pices of paper with schools' names properly hidden. These papers were placed inside three separate boxes which were labelled A, B and C depending on the school's category. The folded papers in each box were thoroughly mixed. To select the schools randomly, three papers were picked from each of the boxes A and B and one from box C. This procedure ensured that the number of schools picked from each category were in the same proportion. A total of seven (7) schools were finally selected. The selected schools gave a total of fourteen (14) classes.

From these selected schools, pupils were randomly selected. As noted earlier, the random selection method reduced the possibility of taking a sample having unsuspected bias. It was also found that since it was not feasible in terms of time and cost to study the entire population, a random sample provided the best representative sample for this study. The selection process involved getting a class list and picking one pupil out of every three in the class list. Thus if number one is picked, number four (4) is picked and then number seven (7) would be picked and so on. This gave a total of one hundred and forty one (141) pupils.

All the standard eight (8) teachers who were teaching six periods per week of mathematics to the selected classes qualified to participate in this study. There were fourteen (14) teachers who participated in this study.

3.3. Instruments

The main research instruments that were used were two questionnaires and the end of term two examination results in mathematics. There was one questionnaire for mathematics teachers and another

one for standard eight (8) pupils. A questionnaire was found appropriate due to a number of reasons. Kerlinger (1973) observes that a questionnaire is widely used in research because it is possible to give similar or standardized questions to the subjects.[4] This makes it possible to compare responses from different subjects on the same questions. It is possible to reach distant subjects by either posting the questionnaire or delivering it to them personally. By using a questionnaire a researcher can guarantee anonymity to the subjects and hence encouraging them to give honest responses. This will consequently increase the reliability of the instrument.

The questionnaire for teachers was in two parts; part one sought the general information about the teacher and other related information. This part required such information as teacher's sex, number of years of teaching in primary schools as trained teachers, academic qualifications, professional grade, the time spent by teachers in coaching standard eight (8) pupils in mathematics and class size. However, it is to be noted that primary school teachers in

Kenya are generally trained to teach all subjects that are taught in primary schools and are not specialised in any one subject. It is also to be noted that, the meaning of the terms academic and professional qualifications are as given in chapter one. This part of the questionnaire also required teachers' suggestions on other factors which they considered to be crucial to pupils' performance in mathematics. The second part of the questionnaire sought the information about the teachers' attitudes towards mathematics.

The pupils' questionnaire was in two parts; the first part required general information about pupils, and this included their sex, age and the availability of mathematics textbooks. Pupils were also expected to indicate from a list, the problems which they thought affected their performance in mathematics. The second part of the questionnaire sought the information on pupils' attitudes towards mathematics.

To elicit attitude responses, the teachers' and pupils' questionnaires contained a Likert type of scale. This was a five (5) point scale, where a respondent chose the appropriate responses by putting

a tick inside the relevant box. Remmers (1965) has noted that this type of scale has several advantages. He says that it is easy to construct when compared to Thurstone's and the Remmers' scales. The scale can be constructed in a relatively short time, and requires no experts (or judges) to sort out the statements of opinion as required in Thurstone's scale. It is also considered to be easy to score. Remmers finally notes that, the results obtained from this type of scale as far as reliability and validity are concerned are quite comparable to those obtained by Thurstone and Remmers.[5] Hence the researcher found this type of scale appropriate to this study.

The end of term two examination results was another instrument used in this study to measure pupils' performance in mathematics. The examination was organized by Kiambu District Education Office and it was done and marked in July 1990. The researcher collected the results of this examination from the selected schools. The schools used a pass mark of fifty (50) percent for this examination. The schools did not give the reasons for the use of fifty as the pass mark. However the researcher noted that KNEC (1989) had used a national mean of 50 points in all

the subjects in the examination, i.e marks for all the subjects were standardized so as to have a mean score of 50 points.[6] The schools could also have assumed that the examination they had given was well moderated and marked and it was given to a normal population whose mean score would be fifty (50) percent. However this mean score was also taken to mean pass mark. It is to be noted that this examination was not set, moderated and marked by specialist. The marks obtained were not standardized to have a mean score of fifty.

3.4 Pretesting of the Instruments

The teachers' and pupils' questionnaires were pretested with twelve (12) standard eight pupils and two (2) standard eight (8) mathematics teachers. The pretest helped the researcher to redesign some of the questions that were asked in the questionnaires. This helped to control the problems of ambiguity and irrelevance and hence improved on the quality of answers that were given by respondents in the research. The improvements on the questionnaires increased the reliability and validity of the instruments.

3.5 Scoring Method

The only part of the questionnaire which required scoring was the attitude scale. There were twenty items in each questionnaire, where the respondents were required to choose one appropriate response from the statements; Strongly Agree (SA), Agree (A), Not Sure (NS), Disagree (D) and Strongly Disagree (SD) for every item. The items given either implied favourable attitudes or unfavourable attitudes. For purposes of scoring, the responses were quantified as follows; items which implied favourable attitudes scored as follows: SA=5, A=4, NS=3, D=2, and SD=1 while items which implied unfavourable attitudes scored SA=1, A=2, NS=3, D=4 and SD=5. The total for all the items measured the attitudes of the respondents towards mathematics. Form the above, it was noted that those who scored four (4) or five (5) in an item had positive attitudes towards that item while those who scored three (3) were neutral, and those who scored one (1) or two (2) had negative attitudes. Hence those who scored above sixty (60) were considered to have positive attitudes and those who scored sixty (60) points were neutral, i.e had neither positive attitudes nor negative attitudes. Those who scored below sixty points were considered to have negative attitudes.

3.6 Procedure for Data Collection

After obtaining the authority to collect data from the relevant authorities, the researcher visited the selected schools for data collection. The researcher administered the questionnaires personally to the selected pupils and teachers in their respective schools. He explained to the respondents the purpose of the study and the instructions to be followed when completing the questionnaires. The respondents were required to fill their questionnaires independently. The researcher made sure the respondents did not consult each other. This was to ensure reliability and validity of the obtained information. After the questionnaires were administered, they were collected for processing.

It may be noted that, apart from the data collected at the field and educational offices, the information obtained from the library was very valuable to this research.

FOOTNOTES

1. Harper W.M. Statistics (5th Edition), London: Longman Group, 1988.

2. Lindgren B.W. Berry D.A. Elementary Statistics, New York: MacMillan Publishing Co. INC 1981.

3. Dowdy S. Wearden S. Statistics for Research, New York: John Wiley & Sons, 1983.

4. Kerlinger F.N. Foundations of Behavioural Research (2nd Edition) New York: Holt Rinehart, 1973.

5. Remmers H.H., Gage N.L. & Rummel J.F., A Practical Introduction to Measurement and Evaluation, New York: Harper & Row Publishers, 1965, p. 315.

6. Kenya National Examinations Council, KCPE Newsletter 1989, p. 162.

CHAPTER FOUR

PRESENTATION AND ANALYSIS OF DATA

4.1 Introduction

The researcher presents and reports the findings of this study in this chapter. The first section of this chapter presents the analysis for pupils' performance in mathematics in the end of term two examination. This is followed by the analysis for pupils' and teachers' attitudes towards mathematics. The remaining sections present the results of testing the hypotheses and analysis of other problems which were suggested by teachers and pupils.

To facilitate the presentation and analysis of data, a number of statistical techniques have been used. Tabular layouts have been used to present data. Harper (1989) observes that the use of tabular layout would enable any desired figures to be located more quickly and would make comparisons between different categories to be made more easily. The layout makes it possible to reveal patterns within figures which cannot be seen in the narrative form. To facilitate comparisons and further computations, frequencies, percentages, means and standard deviation were used. The mean was specifically found useful as

an important measure of central tendency which made use of every value in the distribution. The standard deviation is an important measure of dispersion which also makes use of every value in the distribution.

To test the six hypotheses, a number of statistics were used. Chi-square (X^2) statistics was used for testing the effect of different variables on the pupils' performance in mathematics. In this research this test was specifically used to determine the effect of teachers' attitudes towards mathematics, academic qualifications, professional grade, length of teaching experience on the pupils' performance in mathematics. It was also used to determine the effect of class size, availability of mathematics textbooks and time spent by teachers in coaching pupils in mathematics on pupils' performance in mathematics.

To determine whether there is significant difference between two sample means, Z statistics was used. Z statistics is given by

$$Z = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}}$$

where $\bar{X}_1$, S^2 and n_1 are the mean, variance and sample size of one group respectively while $\bar{X}_2$, S_2^2 and n_2 are the mean, variance and sample size of the other group respectively. This statistics is used when the sample size is greater than thirty (30). Z statistics was used to determine whether there was significant difference in performance in mathematics between pupils taught by male teachers and those taught by female teachers. It was also used to determine whether there was any significant difference in performance in mathematics between boys and girls. Finally, Z statistics was used to determine if there was any significant difference in performance between standard eight (8) pupils of different age groups.

Pearson Product Moment Correlation Coefficient r, is a measure of correlation between two variables. This correlation coefficient r, is given by the formula

$$r = \frac{N\Sigma xy - \Sigma x \Sigma y}{\sqrt{\left[(N\Sigma x^2 - (\Sigma x))^2\right]\left[(N\Sigma y^2 - (\Sigma y))^2\right]}}$$

where x = score for one variable

y = score for the other variable

N = Total number of pupils.

Although this coefficient does not directly establish a causal relationship between variables, it may furnish clues to causes when coupled with other methodological approaches.[1]. This computed coefficient was found appropriate and easy when reporting the relationship between two variables instead of using vague and ambiguous descriptions. The coefficient is useful in comparing results from different populations. To test the significance of a correlation is equivalent to testing the null hypothesis that the correlation is zero in the population from which the sample was drawn. To facilitate the test of significance, the t - ratio, given by the formula

$$t = \frac{r\sqrt{N-2}}{\sqrt{1 - r^2}}$$ where r is the correlation

Coefficient and N is the sample size was used.[2]
To test the significance of the correlation between pupils' attitudes and their performance in mathematics, the Pearson Product-Moment Correlation Coefficient r, and the t - test were used.

4.2 The Analysis of the End of Term Two Examination

The table below shows the analysis of the above examination and the number of pupils who passed or failed by fifty percent (50%). It also shows the class mean scores and the respective standard deviations.

TABLE IV. 1

Analysis of the End of Term Two Examination

SCHOOLS' CODE	STREAM	NUMBER OF PUPILS			MEAN SCORES	STANDARD DEVIATIONS
		PASSED	FAILED	TOTAL		
A_1	I	6	3	9	61.33	15.72
A_2	I	7	3	10	57.60	13.41
A_3	I	5	5	10	51.60	12.64
B_1	I	5	7	12	49.58	17.19
	II	7	5	12	44.83	15.46
B_2	I	7	4	11	54.73	13.94
	II	5	6	11	49.45	15.31
B_3	I	6	3	9	59.56	14.04
	II	8	1	9	60.22	9.50
C	I	3	7	10	39.6	16.94
	II	0	9	9	39	6.79
	III	3	7	10	42	10.73
	IV	5	5	10	47.4	13.92
	V	3	6	9	44.22	7.02
Pupils in all schools combined		70	71	141	49.93	15.40

From the above table it can be seen that six (6) classes had mean scores above 50 and eight (8) classes had mean scores below 50. Classes in the same school and in different schools differed greatly in their mean scores and standard deviations. For example the school with the highest mean score differed by 22.33% with the school with the lowest mean score. There were also major variations among classes and schools in the number of pupils who passed or failed. These results showed that the performance of pupils in different classes and in different schools were affected by different factors. These factors may have been related to the individual pupils, teachers or schools.

The researcher analysed the various variables that were considered in this study to determine their effect on the pupils' performance in mathematics in the examination.

4.3 Analysis of the Pupils' Attitudes Towards Mathematics.

All the selected pupils responded to the attitude scale, and the mean attitude score was 73.01 points and a standard deviation of 11.67. It was observed that

one hundred and twenty one (121) pupils or 85.81% had positive attitudes towards mathematics, three (3) or 2.13% of the pupils were neutral, that is, they had neither negative nor positive attitudes towards mathematics and seventeen (17) or 12.06% of the pupils had negative attitudes towards mathematics. All the pupils who had negative attitudes had failed in the examination. From this analysis, it was concluded that majority of the standard eight (8) pupils had positive attitudes towards mathematics. However, since all the pupils who had negative attitudes had failed in the end of term two examination, it was concluded that attitudes played a vital role in determining the pupils' performance in mathematics in the examination.

4.4 Analysis of the Teachers' Attitudes Towards Mathematics

The mean attitude score for all the fourteen (14) teachers was 79 points and a standard deviation of 5.82. There were six (6) or 42.86% of the teachers who had attitude scores of 79 points and above, while eight (8) or 57.14% of the teachers were found to have attitude scores below 79 points but above 60 points. From these analyses it was concluded that all teachers had positive attitudes towards mathematics.

However, teachers varied in their scores in attitudes, and so the researcher determined the effect of these attitudes on the pupils' performance in mathematics by testing the hypothesis given below.

4.5 Hypothesis One

This hypothesis was in four (4) parts. The hypothesis stated that; pupils' performance in mathematics in the examination is not affected by:

i) teachers' attitudes towards mathematics.
ii) teachers' academic qualifications
iii) teachers' professional grade (certificate).
iv) teachers' experience as trained teachers in primary schools.

To test the hypothesis Chi-square (X^2) technique was used in all the parts of the hypothesis. The analysis and testing of each of the parts of the hypothesis are given below.

4.5.1 Hypothesis One - Part (i)

The first part of hypothesis one stated that: Pupils' performance in mathematics in examination is not affected by the teachers' attitudes towards mathe-

matics. For purposes of analysis, teachers were put into two categories. The first category are those teachers who scored 79 points and above in the attitude scale and the second category are those teachers who scored below 79 points. A 2x2 contingency table is given below showing the number of pupils who passed or failed after being taught by teachers in these two categories.

TABLE IV . 2

Number of Pupils who Passed or Failed and The Teachers' Attitudes Towards Mathematics

TEACHERS' ATTITUDE SCORES (POINTS)	NUMBER OF PUPILS		TOTAL
	PASSED	FAILED	
79 and above	31	31	62
Below 79	39	40	79
TOTAL	70	71	141

Degree of Freedom (DF) = 1 P = 0.05

Computed X^2 = 0.006 and critical value X^2 (1) = 3.841

The computed value of X^2 was found to be less than the critical value at 0.05 level of significance and

hence the null hypothesis was accepted. This meant that pupils' performance in mathematics in the examination was not affected by teachers' attitudes towards mathematics. However, although this conclusion was found true for the sample under study, it is necessary to keep in mind that the sample of the teachers was a small one, and all of them had positive attitudes towards mathematics. This could have resulted in no difference on the pupils' performance in mathematics due to teachers' attitudes.

4.5.2 Hypothesis One - Part (ii)

The second part of hypothesis one stated that: Pupils' performance in mathematics in the examination is not affected by teachers' academic qualification. Teachers in this sample were found to be of three (3) academic levels. Two (2) or 14.29% of the teachers had KJSE certificate, eleven (11) or 78.57% had EACE/KCE certificate and one (1) or 7.14% had KACE certificate. A 3x2 contingency table is given below showing the number of pupils who passed or failed after being taught by teachers from these three levels.

TABLE IV.3

Number of Pupils who Passed or Failed and Teachers' Academic Qualifications

TEACHERS' ACADEMIC QUALIFICATIONS	NUMBER OF PUPILS		TOTAL
	PASSED	FAILED	
KJSE	3	15	18
EACE	62	51	113
KACE	5	5	10
TOTAL	70	71	141

DF = 2 P = 0.05

Computed X^2 = 9.071 and critical $X^2(2)$ = 5.991

The computed X^2 value is greater than the critical X^2 value and hence the null hypothesis was rejected. This meant that pupils' performance in mathematics in the examination was significantly affected by teachers' academic qualifications. In effect, there was a higher proportion of pupils passing after being taught by teachers who had higher academic qualifications i.e. EACE and KACE than pupils who were taught by teachers with lower academic qualifications i.e. KJSE.

4.5.3 Hypothesis one - Part (iii)

The third part of hypothesis one stated that: Pupils' performance in mathematics in the examination is not affected by teachers' professional grade. It was found that three (3) or 21.43% of the teachers in this sample were of P_2 professional grade and eleven (11) or 78.57% of the teachers were of P_1 professional grade. A 2x2 contingency table is given below to show the number of pupils who passed or failed after being taught by teachers who held these professional grades.

TABLE IV. 4

Number of Pupils who Passed or Failed and Teachers' Professional Grades

TEACHERS' PROFESSIONAL GRADE	NUMBER OF PUPILS		TOTAL
	PASSED	FAILED	
P_1	60	51	111
P_2	10	20	30
TOTAL	70	71	141

DF = 1 P = 0.05

Computed X^2 = 4.051 and critical $X^2(1)$ = 3.841

From the above analysis, the computed X^2 value is greater than the critical X^2 value, and hence the above hypothesis was rejected. It was then concluded that pupils' performance in mathematics in the examination was significantly affected by teachers' professional qualifications. It was further observed that there was a higher proportion of pupils who passed after being taught by P_1 teachers than those taught by P_2 teachers.

4.5.4 Hypothesis One - Part iv

The fourth part of hypothesis one stated that: Pupils' performance in mathematics is not affected by teachers' teaching experience in primary schools. It was found that only one (1) or 7.14% of the teachers had teaching experience in the range 0-4 years, and also only one (1) or 7.14% in the range 5 - 8 years, two (2) or 14.29% had teaching experience in the range 9-12 years and ten (10) or 71.43% had thirteen (13) years and above of teaching experience in primary schools. For purposes of analysis, teaching experience was put into two categories. First category was teaching experience of less than thirteen (13) years, and there were four (4) teachers in this category, and the second category was thirteen (13) years and

above, and there were ten (10) or 71.43% of the teachers. A 2x2 contingency table is given below showing the number of pupils who passed or failed after being taught by teachers in the two categories.

TABLE IV.5

Number of Pupils who Passed or Failed and Teachers' Teaching Experience

TEACHING EXPERIENCE	NUMBER OF PUPILS		TOTAL
	PASSED	FAILED	
13 years and above	45	54	99
Below 13 years	25	17	42
TOTAL	70	71	141

Df = 1 P = 0.05

Computed X^2 = 2.335 and critical $X^2(1)$ = 3.841

From the above analysis, it was found that the computed value of X^2 was less than the critical X^2 value. This meant that the null hypothesis stated above was accepted. Hence, teachers' experience did not have a significant effect on pupils' performance in mathematics in the examination.

4.6 Hypothesis Two

This null hypothesis stated that:
There is no significant difference in performance in mathematics in the examination between pupils taught by male teachers and those taught by female teachers with everything else being equal.

The analysis showed that three (3) or 21.43% of the teachers were female teachers and eleven (11) or 78.57% were male teachers. The hypothesis was tested by use of Z - statistics. The table below shows the values necessary to compute Z.

TABLE IV. 6

Teachers' Sex and Number of Pupils, Mean Scores and Standard Deviations

TEACHERS' SEX	NUMBER OF PUPILS	MEAN SCORES	STANDARD DEVIATIONS
Male	111	50.63	16.01
Female	30	47.33	15.63

P = 0.05

Computed Z = 1.202 and critical Z = 1.96

From the above analysis, the computed Z value was found to be less than the critical Z value and hence the above null hypothesis was accepted. Hence it was concluded that there was no significant difference in performance in mathematics between pupils taught by male teachers and those taught by female teachers with everything else being equal. In effect, although there is a difference in performance in mathematics between the two groups in favour of male teachers as indicated by a higher mean score, the difference is not significant. Hence, this study showed that pupils' performance did not depend on teachers' sex.

4.7 Hypothesis Three

The null hypothesis stated that:

There is no significant correlation between pupils' attitudes towards mathematics and their performance in mathematics in the examination.

To establish the existence of a correlation, Pearson Product - Moment Correlation Coefficient, r was computed, between pupils' attitudes towards mathematics, represented by y, and the pupils' end of term two mathematics examination score (x). To test the

significance of the correlation, t-test was used. The table given below shows the values used to calculate the Pearson Product-Moment Correlation Coefficient.

TABLE IV. 7

Values for Computing Pearson Product - Moment Correlation Coefficient

NUMBER OF PUPILS	Σx	Σy	Σxy	Σx^2	Σy^2
141	7040	10,295	530,105	384,926	770,885

P = 0.005

The value of r = 0.64. Using r = 0.64, the computed t value was found to be 9.846 and critical t (139) = 1.645, df = 139.

From the above analysis, there is a positive correlation between pupils' attitudes and their performance in mathematics in the examination. To test the significance of this correlation, it was found that the computed value of t was greater than the critical value of t, and hence the null hypothesis stated above was rejected. This meant that, there is a significant correlation between pupils' attitudes towards mathematics and their performance in mathematics in the

examination. However, it should be noted that, the existence of a positive correlation does not imply causation, but it may suggest a possible relation or association between pupils' attitudes towards mathematics and their performance in mathematics in the examination. The result, in effect showed that pupils with high attitude scores were more likely to get a high score in mathematics and vice versa.

4.8 Hypothesis Four

This hypothesis as stated in null form was: There is no significant difference in performance in mathematics in the examination between boys and girls. To test this hypothesis, Z statistics was used. The table below gives the values used to compute the Z value.

TABLE IV. 8

Number of Pupils, Mean Score, Standard Deviations and Their Sex

PUPILS' SEX	NUMBER OF PUPILS	MEAN SCORE	STANDARD DEVIATIONS
Boys	67	52.75	15.28
Girls	74	47.38	15.05

Computed Z = 2.116 and the critical Z = 1.96. P = 0.05

From the above analysis it was found that there is a sex difference in performance in mathematics in the examination in favour of boys as indicated by a higher mean score. To test the significance of the difference, it was found that, the computed Z value was greater than the critical Z value, and hence the null hypothesis stated above was rejected. This implied that there is a significant sex, difference in performance in mathematics in the examination in favour of boys.

4.9 Hypothesis Five

The null hypothesis stated that:

There is no significant difference in performance in mathematics in the examination between standard eight (8) pupils of different age groups.

The mean age of the pupils in this sample was found to be fifteen (15) years. The age of pupils ranged from 12 to 18 years. Only one (1) pupil was found to be 12 years, seven (7) or 4.96% of the pupils were 13 years, thirty six (36) or 25.53% were 14 years, fifty three (53) or 37.59% were 15 years, thirty five (35) or 24.82% were 16 years, seven (7) or 4.96% were 17 years and two (2) or 1.42% were 18 years.

To test this hypothesis, pupils were divided into two (2) age groups; those below fifteen (15) years and those who were fifteen (15) years and above. Z statistics was used to test the above null hypothesis.
The table below shows the values used to compute Z - value.

TABLE IV·9

Number of Pupils, Mean Scores, Standard Deviations and Their Age Groups

PUPILS' AGE GROUPS	NUMBER OF PUPILS	MEAN SCORE	STANDARD DEVIATIONS
Below 15 years	44	48.59	15.46
15 years and above.	97	50.54	15.33

Computed Z = 0.696 and the critical Z = 1.96 P = 0.05

From the above analysis, it was found that, there is a difference in performance in mathematics between the two age groups, and this was in favour of the older pupils, ie. those who were 15 years and above. However, a further analysis showed that the computed value of Z was less than the critical value of Z and hence the null hypothesis stated above was accepted. This implied that the difference between the groups of pupils who were in their formal opera-

tional stage of development was not statistically significant at 0.05 level of significance. These findings are in agreement with the findings of Piaget.

4.10 Hypothesis Six

This hypothesis was in three parts and it was stated in null form thus:

Pupils' performance in mathematics in the examination is not affected by:

i) class size
ii) availability of mathematics textbooks
iii) time spent by teachers in coaching pupils in mathematics.

All the parts of this hypothesis was tested using Chi-square(X^2) technique. The different parts of this hypothesis were tested as given below.

4.10.1 Hypothesis Six - Part (i)

The first part of hypothesis six stated that: Pupils' performance in mathematics in the examination is not affected by class size.

To test this hypothesis, the researcher divided the class sizes into two categories; First , classes

with less than thirty (30) pupils and second, classes with more than thirty (30) pupils. This type of classification is as suggested in the research carried out by SMSG, as reported by Begle (1973).[3]

A 2 x 2 contingency table is given below, showing the number of pupils who passed or failed and were in the two categories of class sizes.

TABLE IV·10

Number of Pupils who Passed or Failed and Class Sizes

CLASS SIZES	NUMBER OF PUPILS		TOTAL
	PASSED	FAILED	
30 and above	29	27	56
Below 30	41	44	85
TOTAL	70	71	141

Df = 1 P = 0.05

Computed X^2 = 0.171 and critical X^2 (1) = 3.841

From the above analysis, it was found that the computed X^2 value is less than the critical X^2 value

and hence the null hypothesis was accepted. This implied that pupils' performance in mathematics in the examination is not significantly affected by class size.

4.10.2 Hypothesis Six - Part (ii)

The second part of hypothesis six stated that: Pupils' performance in mathematics in the examination is not affected by availability of mathematics textbooks.

It was found that, in this sample of pupils, some had textbooks, while others did not have textbooks. One hundred and six (106) or 75.18% of the pupils had textbooks and forty eight (48) or 42.28% of these pupils failed in the examination. On the other hand thirty five (35) or 24.82% of the pupils did not have mathematics textbooks, and twenty three (23) or 65.71% of these pupils failed in the examination.

To test the above hypothesis, pupils were divided into two categories; those who had mathematics textbooks and those who did not have mathematics textbooks. The contingency table given below shows the

number of pupils who passed or failed and had mathematics textbooks or not.

TABLE IV.11

Number of Pupils Who Passed or Failed and Availability of Mathematics Textbooks

AVAILABILITY OF MATHEMATICS TEXT-BOOKS	NUMBER OF PUPILS		TOTAL
	PASSED	FAILED	
Pupils with text-books.	58	48	106
Pupils without textbooks	12	23	35
TOTAL	70	71	141

Df = 1 P = 0.05

Computed $X^2 = 4.4$ and critical X^2 (1) = 3.841

From the above analysis, the computed X^2 is greater than the critical X^2 value and hence the null hypothesis was rejected. This implied that pupils' performance in mathematics in the examination is significantly affected by availability of mathematics textbooks. The analysis also showed that a bigger proportion of pupils who did not have mathematics

textbooks failed than those who had textbooks. The above conclusion is in agreement with the findings of Kiragu (1986); who observed that, the evidence of a relationship between achievement and availability of textbooks is more consistent than that between achievement and other variables such as teacher training, class size etc.[4]

4.10.3 Hypothesis Six - Part (iii)

Part three of hypothesis six stated that: Pupils' performance in mathematics is not affected by the time spent by teachers in coaching pupils in mathematics. It was found that schools had different coaching programmes both during school sessions and also during school holidays. Eighty seven (87) pupils were coached for a duration of 0-5 hours per week and fifty four (54) pupils were coached for a duration of over 5 hours per week during school session. Forty (40) pupils were coached for a duration of 0-5 hours per week and one hundred and one (101) pupils were coached for over 5 hours per week during school holidays. The hypothesis was tested in two parts; coaching during school sessions and coaching during school holidays. The durations for coaching

were put in two categories; 0-5 hours per week and above 5 hours per week. The following contingency tables show the number of pupils who passed or failed after being coached for the two durations.

TABLE IV.12

Number of Pupils Who Passed or Failed and the Time Spent by Teachers in Coaching Pupils in Mathematics During School Session

TIME SPENT IN COACHING (IN HOURS)	NUMBER OF PUPILS		TOTAL
	PASSED	FAILED	
0-5	42	45	87
Above 5	28	26	54
TOTAL	70	71	141

Df = 1 P = 0.05

Computed X^2 = 0.17 and critical X^2 (1) = 3.841

From the above analysis, it was found that the computed X^2 value is less than the critical X^2 value, and hence the null hypothesis was accepted. This implied that the time spent in coaching pupils in

mathematics during school session has no effect on pupils' performance in mathematics in the examination.

TABLE IV. 13

Number of Pupils Who Passed or Failed and the Time Spent by Teachers in Coaching Pupils in Mathematisc During School Holidays

TIME SPENT IN COACHING (IN HOURS)	NUMBER OF PUPILS		TOTAL
	PASSED	FAILED	
0-5	21	19	40
Above 5	49	52	101
TOTAL	70	71	141

Df = 1 computed X^2 = 0.182 and critical $X^2(1)$ = 3.841 P = 0.05

The above analysis showed that, the computed X^2 value was less than the critical X^2 value and hence the null hypothesis was accepted. This meant that the time spent in coaching pupils in mathematics during school holidays had no effect on pupils' performance in mathematics in the examination.

In conclusion, this study showed that, the time spent by teachers in coaching pupils in mathematics either during school holidays or school sessions had no effect on pupils' performance in mathematics in the examination.

4.11 Problems Identified by Pupils

There were attempts to identify some problems which were likely to affect pupils' performance in mathematics. The researcher gave a list of five problems from which pupils indicated which of these problems, if any, they thought had affected their performance in mathematics in the examination. The table below shows the problems given by the researcher and the number and percentages of pupils who considered that, a given problem had affected their performance in mathematics.

TABLE IV. 14

Number and Percentages of Pupils Affected by the Given Problems

NO.	PROBLEMS AFFECTING PUPILS' PERFORMANCES	NUMBER OF PUPILS	PERCENTAGES OF PUPILS
1	Lack of Mathematics Text-books and equipment	75	53.19
2	Lack of enough time to study.	37	26.24
3	Language used in mathe-matics examination is difficult.	30	21.28
4	Lack of interest in mathematics	28	19.86
5	Mathematics is a diffi-cult subject.	23	16.31

From the above analysis, majority of pupils considered lack of mathematics textbooks and equipment to be affecting their performance in mathematics. This seemed to be confirmed by the findings in section 4.10.2, where it was found that, the availability of mathematics textbooks had a significant effect on pupils' performance in mathematics in the examination. Pupils also considered lack of enough time to study, language used in examination as being difficult, lack of interest in mathematics and mathematics as a

difficult subject as problems which affected their performance in mathematics.

4.12 Problems Identified by Teachers

Teachers were asked to suggest problems which they thought affected their pupils' performance in mathematics in the examination. The table below shows problems identified and the number and percentage of teachers who identified the problem.

TABLE IV. 15

Problems Identified, Number and Percentage of Teachers Who Identified Each Problem

NO.	PROBLEMS AFFECTING PUPILS' PERFORMANCE	NUMBER OF TEACHERS	PERCENTAGES OF TEACHERS
1	Lack of mathematics text-books, supplementary materials and equipment	8	57.14
2	Lack of time to study	7	50
3	Lack of practice in mathematics.	6	42.86
4	Lack of good foundation in lower classes.	5	35.71
5	Lack of interest in mathe-matics by pupils	5	35.71
6	Language used in mathe-matics exam. is difficult	4	28.57
7	Domestic problems	4	28.57
8	Negative attitudes towards mathematics.	3	21.43
9	Large classes	2	14.29

From the above analysis, majority of teachers considered lack of mathematics textbooks, supplementary materials and equipment as having a major effect on pupils' performance in mathematics. Majority of the pupils had similar consideration. This seemed to be confirmed by the findings of section 4.10.2. Lack of time to study was also considered important by most of the teachers and pupils. The rest of the problems are listed above in order of merit as indicated by the number of teachers who identified them.

In conclusion, majority of the teachers and pupils considered lack of mathematics textbooks and lack of time to study as having a major effect on pupils' performance in mathematics.

FOOTNOTES

1. Dowdy S., Weardens, Statistics for Research New York: John Wiley & Sons, 1983, p. 230.

2. Ibid., p. 232.

3. Begle E.G. "Some lessons learned by SMSG", Mathematics Teacher 1973, Vol. 66 No. 33 pp. 207-214.

4. Kiragu F.W. "Achievement in Mathematics: An Investigation of the Factors that Contribute to Mass failure in KCE Mathematics." BER Seminar Paper No. 20124, Kenyatta University, Nairobi, Dec. 1986.

CHAPTER FIVE

SUMMARY, CONCLUSIONS IMPLICATIONS AND RECOMMENDATIONS

5.1 Introduction

In this chapter, the researcher summarises, concludes and gives implications and recommendations of this study. The summary includes a review of the objectives of the study, literature review and the methodology used. The conclusions are based on the analysis of chapter four while the implications are based on these conclusions. Finally, the researcher gives recommendations for further research and the usefulness of the study.

5.2 Summary

The main purpose of the study was to find the effect of the various teachers' and pupils' characteristics on the performance of pupils in mathematics. The data for this study was collected from one hundred and forty one (141), standard eight (8) pupils in seven (7) schools in Githunguri Educational Zone, Kiambu District, Kenya. The teachers' characteristics that were considered included teachers' attitudes towards mathematics, sex, teaching experience, academic

and professional qualifications. Pupils' characteristics that were considered included pupils' attitudes towards mathematics, their sex and age. The researcher considered three factors that were considered closely related to both teachers and pupils. These factors were class size, availability of mathematics textbooks and the time spent by teachers in coaching pupils in mathematics. This study intended to determine the effect of these variables on pupils' performance in mathematics. It was hoped that the study would be of great importance to teachers, pupils, parents, educational administrators and curriculum developers in pointing out the effect of the various variables on pupils performance in mathematics.

The review of literature in chapter two indicated that a number of factors have been studied in relation to performance in mathematics. Studies in Kenya have been done by Kibanza (1980), Mwangi (1986), Kiragu (1986), Eshiwani (1983), Riungu (1986) etc.

At international level, studies by Husen (1967) had significant contribution to the study of achievement in mathematics.

Chapter three described the methodology that was followed in this study.

Chapter four gives the presentation and analysis of data. The findings were presented using tables and to test the hypotheses, a number of statistical techniques were used. Means, standard deviations and percentages were used to present and analyse data. Chi-square (X^2), Z test, Pearson Product Moment Correlation Coefficient and t-test were used to test the various hypotheses.

5.3 Conclusions

The following are the main findings of this study:

a) It was found that teachers' attitudes had no significant effect on pupils' performance in mathematics.

b) It was found that pupils' performance in mathematics in the examination was signi-

ficantly affected by teachers' academic qualifications and teachers' professional grade.

c) It was found that pupils' performance in mathematics in the examination was not affected by teachers' teaching experience in primary schools, class size and the time spent by teachers in coaching pupils in mathematics.

d) No significant difference was found in pupils' performance in mathematics in the examination between pupils taught by male teachers and those taught by female teachers with everything else being equal.

e) No significant difference was found in performance in mathematics in the examination between standard eight (8) pupils of different age groups.

f) It was found that, there was a significant difference in performance in mathematics in the examination between boys and girls. The sex difference in performance in mathematics was found to be in favour of boys.

g) It was found that, there was a significant positive correlation between pupils' attitudes towards mathematics and their performance in mathematics in the examination.

h) Majority of teachers and pupils considered the availability of mathematics textbooks, supplementary materials and equipment as having an effect on pupils' performance in mathematics in the examination.

i) Teachers and pupils considered lack of enough time to study, lack of interest in mathematics by pupils and use of difficult language in mathematics examinations as contributing to pupils' poor performance in mathematics in the examination.

5.4 Implications of the Study

The following implications were derived from the above conclusions:

a) Since teachers' academic and professional qualifications were found to have a significant effect on pupils' performance in mathematics, there is need to improve the teachers' academic and professional training in order to improve the pupils'

performance in mathematics.

b) The positive correlation between pupils' attitudes towards mathematics and their performance in mathematics in the examination indicated that it is necessary to develop in pupils positive attitudes towards mathematics. Pupils with positive attitudes study mathematics because they enjoy it and it gives them satisfaction. It can also be noted that attitudes determine not only the pupils' willingness to learn mathematics but also its application to life. It is necessary that mathematics teachers should be sensitive to their pupils' attitudes towards mathematics. Teachers must try to motivate their pupils by using appropriate teaching methods. This will consequently improve the pupils' performance in mathematics.

c) Teachers should help their pupils in learning and understanding mathematics. This can be done by use of teaching aids, individualized instruction to improve on pupils' performance in mathematics.

d) The curriculum planners and developers should consider allocating more time to the teaching and learning of mathematics. The language used in mathematics examinations should be clear to the pupils.

e) The Ministry of Education and parents should provide the necessary textbooks, supplementary materials and equipment to schools to improve on pupils' performance in mathematics.

5.5. Recommendations for Further Research

The following are some recommendations for further research:

a) There is need to replicate this study to include a bigger sample of schools, classes, pupils and teachers in primary schools to ratify the findings of this research.

b) There is need for research to be undertaken on other factors that are likely to affect the pupils' performance in mathematics. Such factors should include the socio-economic and environmental factors.

c) Research studies should be undertaken on the preparations and the effectiveness the teachers on the various methods of teaching mathematics.

5.6 Usefulness of the Study

This study will be found useful to teachers, pupils, parents, educational administrators and curriculum planners and developers. Some pupils' and teachers' characteristics have been identified and found to have significant effects on pupils' performance in mathematics in the examination. There is need for teachers, pupils, parents and educational administrators to correct the situation in order to improve pupils' performance in mathematics particularly in Githunguri Educational Zone of Kiambu District Kenya. Although this study may not necessarily be generalized to other areas, it will be useful in attempting to identify problems and finding their solutions. The study will be useful to curriculum planners and developers since it has identified the lack of textbooks and other materials, and lack of enough time to teach and study mathematics as being factors affecting pupils' performance in mathematics.

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APPENDIX A

QUESTIONNAIRE FOR STANDARD EIGHT(8) PUPILS

Instructions:

(i) This questionnaire is divided into two parts: Part one and Part two.

(ii) Answer all the questions.

(iii) You are advised to be honest.

PART ONE

1. School: ..... Class: .....

2. Sex:

   Male: ..... Female: .....

3. Age: ..... Years

4. Do you have the commonly used mathematics book (textbook) for your class?

   Yes: ..... No: .....

5. Put a tick (✓) against any of the following problem(s) which you think affect your performance in mathematics.

   i) Lack of enough time to study .....

   ii) Lack of enough mathematics books and equipment .....

   iii) Language used in the examinations is difficult to understand .....

iv) Lack of interest in mathematics .....

v) Mathematics is a difficult subject to understand. .....

PART TWO

Instructions:

(i) Please show how you feel about mathematics by putting a tick (✓) inside one of the boxes. Your feelings are represented by words strongly agree, agree, not sure, disagree and strongly disagree.

(ii) There is no correct or wrong answers in this section.

(iii) You are requested to be honest.

	STRONGLY AGREE	AGREE	NOT SURE	DISAGREE	STRONGLY DISAGREE
1. Mathematics is more interesting than any other subject in school.					
2. Mathematics is very hard to understand.					
3. The number of mathematics lessons should be increased					
4. I enjoy doing my homework in mathematics					
5. I dislike tests and examinations in mathematics					
6. Mathematics is an important subject in school.					
7. Mathematics is a very dull subject					
8 I sometimes do extra work in mathematics					
9. Mathematics only requires memorizing of formulae without understanding them.					
10 I like trying difficult problems in mathematics					

		STRONGLY AGREE	AGREE	NOT SURE	DISAGREE	STRONGLY DISAGREE
11	Mathematics is of no use to me.					
12	Story books are more interesting to read than mathematics books.					
13	The number of lessons in mathematics should be reduced.					
14	Mathematics is an important subject in our daily life.					
15	There is no time for extra work in mathematics.					
16	I can get a better mark in mathematics if I worked harder.					
17	Mathematics is an easy subject and is full of fun					
18	Tests, examinations and exercises are useful in mathematics.					
19	I always avoid difficult problems in mathematics.					
20	I would like to do more mathematics in secondary school.					

APPENDIX B

QUESTIONNAIRE FOR PRIMARY SCHOOL TEACHERS

Instructions

(i) This questionnaire is divided into two parts:

Part one and Part two. Part one requires general information about yourself and school and part two requires information about your attitudes towards mathematics.

(ii) You are requested to answer all the questions.

(iii) You are also requested to be honest.

(iv) The information you will give will be treated confidentially.

PART ONE

Instructions

Please indicate by writing or putting a tick (✓) the information required in each item.

1. School: .....

   The class you teach mathematics in std. 8 .....

2. Sex:

   Male: ..... Female: .....

3. The highest academic qualification that you have attained is:

(i) KCPE/CPE/KAPE: .....

(ii) KJSE: .....

(iii) EACE/KCE/GCE .....

(iv) KACE/EAACE .....

(v) Other(s) .....

Specify .....

4. The highest professional grade that you have achieved are:

(i) P_4 ..... (ii) P_3 .....

(iii) P_2 ..... (iv) P_1 .....

(v) S_1 .....

(vi) Approaved Teachers Status: .....

(vii) Other(s) .....

Specify: .....

5. The number of years of teaching as a trained teacher in primary school is:

(i) 0-4 ..... (ii) 5-8 .....

(iii) 9-12 .....

(iv) 13 and above .....

6. (a) The average number of hours you spend per week in coaching your pupils in mathematics during school session is

a) 0-5 ..... (ii) 6 and above ...

b) The average number of hours you spend per week in coaching your pupils in mathematics during school holidays is

(i) 0 - 5 .....

(ii) 6 and above .....

The total number of pupils in your class is .....

List FOUR problems which you think affect the performance of your pupils in mathematics.

i) .....

ii) .....

iii) .....

iv) .....

PART TWO

Instructions

i) Please indicate how you feel about mathematics by showing your extent of agreement using the words strongly agree, agree, not sure, disagree and strongly disagree.

ii) Put a tick inside the box of your choice.

iii) Note that there is no correct or wrong answers in this section.

	STRONGLY AGREE	AGREE	NOT SURE	DISAGREE	STRONGLY DISAGREE
1. Mathematics is a subject which develops reasoning and it is quite stimulating.					
2. Too many lesson each week are devoted to mathematics.					
3. Girls are, on the whole, incapable of becoming good mathematicians					
4. It is always important that pupils understand facts, concepts and procedures					

		STRONGLY AGREE	AGREE	NOT SURE	DISAGREE	STRONGLY DISAGREE
	before they do any problems in mathematics					
5	School mathematics is too divorced from reality					
6.	Mathematics is the easiest subject to teach.					
7.	Mathematics teachers should be concerned with applications of mathematics only.					
8.	Mathematics is particularly suited to develop independent and self-reliant habits of mind.					
9	Pupils who fail in mathematics should not be punished.					
11	Girls are as good as boys in mathematics.					

	STRONGLY AGREE	AGREE	NOT SURE	DISAGREE	STRONGLY DISAGREE
11 Mathematics should not be taught to all pupils in primary schools.					
12 Group work and discovery methods are too demanding and time wasting to be of any practical use in primary schools.					
13 Mathematics is quite interesting and enjoyable to teach.					
14 It is always important that pupils memorize definitions, formulae and facts before doing any problems.					
15 I always lose confidence when I make a mistake in mathematics class.					
16 The study of mathematics tends to dull the imagination of pupils					

	STRONGLY AGREE	AGREE	NOT SURE	DISAGREE	STRONGLY DISAGREE
17 The teaching of mathematics should be more practical oriented than it is today					
18 There is little scope for creativity in the learning of mathematics					
19 Mathematics teachers should only solve difficult problems in the class.					
20 Mathematics is quite applicable to our daily life.					

APPENDIX C

KENYATTA UNIVERSITY

FACULTY OF EDUCATION

DEPARTMENT OF EDUCATIONAL COMMUNICATION & TECHNOLOGY

OUR REF: .....

YOUR REF: .....

DATE: 22ND SEPT 1990.

Dear Sir/Madam

TO WHOM IT MAY CONCERN

The bearer MR. IRUMBI, SAMUEL G. is a bonafide 2nd year student of the M.Ed. (PTE) programme at Kenyatta University in the Department of Educational Communication and Technology.

Kindly assist him/~~her~~ in the collection of information for his/~~her~~ project.

Thanking you for the anticipated assistance.

Yours sincerely,

Ochieng Moya

OCHIENG MOYA

M.ED. (PTE) COURSE CO-ORDINATOR

OM/gr.

APPENDIX D

Samuel Gathogo Irumbi,
Kenyatta University,
P.O. Box 43844
NAIROBI

24th Sept. 1990

District Education Office,
P.O. Box 9
KIAMBU

Dear Sir,

RE: PERMISSION TO COLLECT DATA FOR RESEARCH PROJECT

I wish to apply for permission to visit schools in Githunguri Educational Zone to collect data for research project. I am a student of Masters of Education (Primary Teacher Education) Programme at Kenyatta University and I am required to conduct an educational research project in partial fulfilment of my degree course.

The data to be collected will be for educational purposes only. The title of my project is "A study of Teachers' and Pupils' Characteristics that Affect the Performance of Standard Eight (8) Pupils in Mathematics in the End of Term Two Examination in Githunguri Educational Zone, Kiambu District, Kenya.

I will be grateful if you allow me to carry out this exercise.

Yours faithfully,

MR. SAMUEL GATHOGO IRUMBI

APPENDIX E

MINISTRY OF EDUCATION

DISTRICT EDUCATION OFFICE
P.O. BOX 9
KIAMBU

All Headteachers
GITHUNGURI ZONE.

2nd October, 1990

AUTHORITY TO CARRY OUT RESEARCH

The bearer Mr. Irumbi S. Gathogo is a student of the M.ED. (Primary Teacher Education) programme at Kenyatta University in the department of Educational Communication and Technology.

Please assist him in the collection of information from your school for his research programme.

D. GATHOGO
for: DISTRICT EDUCATION OFFICER
KIAMBU

c.c. The A.E.O.
GITHUNGURI

The A.P.S.I.
GITHUNGURI ZONE.