A STUDY OF FACTORS THAT AFFECT PROSPECTIVE PRIMARY SCHOOL TEACHERS ACHIEVEMENT IN MATHEMATICS: KENYA

A RESEARCH PROJECT SUBMITTED TO THE FACULTY OF EDUCATION IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE DEGREE OF MASTER OF EDUCATION IN THE KENYATTA UNIVERSITY.

BY

JOSEPH A. ONDU NYANGAYO

1986

Nyangayo, Joseph A. A study of factors that affect
DECLARATION

THIS RESEARCH PROJECT IS MY ORIGINAL WORK AND HAS NOT BEEN PRESENTED FOR A DEGREE IN ANY OTHER UNIVERSITY.

JOSEPH A. ONDU NYANGAYO

"THIS RESEARCH PROJECT PAPER HAS BEEN SUBMITTED FOR EXAMINATION WITH MY APPROVAL AS UNIVERSITY SUPERVISOR".

PROFESSOR G. S. ESHIWANI
DIRECTOR, BUREAU OF EDUCATIONAL RESEARCH
KENYATTA UNIVERSITY.
The author would like to express his appreciation and gratitude to my hardworking and friendly supervisor, Prof. George S. Eshiwani for the excellent guidance he gave me while I was working on this research project. His suggestions and comments were very useful particularly during the early stages of planning to conduct this study.

Thanks also go to members of staff from the Bureau of Educational Research, particularly the Librarian, Secretary and Mr. Obare who made things looked possible.

The writer is indebted to the Principals, members of staff and students of the colleges involved in the study and I hope that the findings reported will be of value to them in future academic work.

Special thanks also goes to Mrs. Jane Oyuga and Mrs. D.O. Rabar for the typing of the preliminary and final manuscript respectively.

Finally I am also grateful to my Parents, Mrs. Dorice Nyangayo, my brother, Walter Ogola Nyangayo, my sisters, Mrs. Sofia Otieno and Rose Akoth whose invaluable support made me succeed in my Education.
DEDICATION

This work is dedicated to my beloved wife Margaret Atieno, my sons Isack Otieno and Godfrey Ochieno, my daughters Sara Adhiambo and Christine Juma who tirelessly gave me the encouragement and bear the pain and suffering during the entire period of study. The atmosphere they created which was conducive to study made this work possible.
ABSTRACT

The main purpose of this study was to look at the factors that affect prospective Primary School teachers achievement in mathematics. The researcher used two kinds of questionnaire in trying to find some qualitative and quantitative information about the factors that affect prospective Primary School teachers.

The questionnaires were marked manually and the data were analysed using a calculator CASIO fx - 82. The distributions of variables and cross tabs were used in the analysis in Chapter Four. The achievement and methodology tests were marked using scheme - 1- for correct response; 0-for incorrect response, and 9-for missing data.

The scores were then analysed by use of Analysis of Variance, (ANOVA), t-test and percentages, means and standard deviations for the attitude scale. A t-test analysis revealed that there was significant performance of students at C.P.E. and K.C.E. and Teachers examination (P.T.E.) in mathematics. The same t-test was used to find out the difference in performance between males and females among prospective teachers. The results were that there is a significant difference between the sexes.
(vi)

The two-way ANOVA was used to analyse the relationship between previous schools attended by students and achievement in mathematics. It was found out that previous schools attended and socio-economic background affects the students performance at T.T.C.

Percentages and means were computed to find out the attitudes of students towards mathematics. The attitude scale had 28 items, 14 were negatively worded while 14 were positively worded. The results revealed that prospective teachers had a positive attitude towards mathematics but their performance in mathematics and methods papers was poor. It was found out that attitudes do not determine performance in mathematics at T.T.C.

There should be specialization so that prospective teachers are not over burdened by 14 subjects some of which they may not like or understand. For the time being the researcher recommended at least six subjects so that proper training can take place. The duration for training should be extended from the current two years to three years.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Title of the Study</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Declaration</td>
<td>ii</td>
</tr>
<tr>
<td>Acknowledgment</td>
<td>iii</td>
</tr>
<tr>
<td>Dedication</td>
<td>iv</td>
</tr>
<tr>
<td>Abstract</td>
<td>v-vi</td>
</tr>
<tr>
<td>Table of Contents</td>
<td>vii-ix</td>
</tr>
<tr>
<td>List of Tables</td>
<td>x</td>
</tr>
</tbody>
</table>

## CHAPTER ONE

**INTRODUCTION**

1.0 Introduction ................................ 1
1.1 Statement of the Problem ................. 6
1.1.0 History of the Problem ................. 6
1.1.1 Statement of the Problem .............. 7
1.2 Purpose of the Study ..................... 8
1.3 Hypotheses of the Study ................. 8
1.4 The Variables in the Study .............. 9
1.4.1 The dependent variables ............... 9
1.4.2 The Independent Variables ............. 9
1.4.3 Intervening Variables ................. 10
1.5 Limitation of this Study .................................. 11
1.5.1 Limitation on the Choice of Colleges ...................... 11
1.5.2 Limitation on the time available for testing ................ 11
1.5.3 Limitation on the Choice of Respondents .................. 12
1.5.4 Limitation of the Availability of related Literature ........ 12
1.5.5 Limitation of the Pre-testing the materials ................. 13
1.6 Organization of the Study by Chapters ....................... 13

CHAPTER TWO
REVIEW OF RELATED LITERATURE .......................... 15

2.0 Introduction ............................................. 15
2.1 Literature related to teachers Education ..................... 16
2.2 Literature related to Sex differences ......................... 22
2.3 Literature related to Attitudes towards mathematics .......... 23

CHAPTER THREE
RESEARCH DESIGN AND METHODOLOGY .................... 27

3.0 Introduction ............................................. 27
3.1 The Research Sample and its Selection ....................... 27
3.2 The Research instruments .................................. 29
3.3 Methods and Procedure for test Administration ............... 30
3.4 Data Coding .............................................. 32
3.5 Scoring the Questionnaires ................................ 33
LIST OF TABLES

1. Mathematics Performance in C.P.E. Percentage Pass in six years 1
2. Mean Performance of candidates in mathematics at K.C.E. Expressed as Percentage Pass 2
3. Sex difference in Performance at different subjects 4
4. Summary of the Codes Used in the Study 32
5. Distribution of Sexes in the three Colleges 33
6. Performance in Mathematics at C.P.E. 37
7. Grade obtained in mathematics at K.C.E. 37
8. Mean Scores and t-values for difference between O-level and teachers Examination mathematics results. 38
9. Mean Score and t-value for difference between sexes based on the Achievement test 39
10. Mean Score and t-value for differences between sexes based on the Methodology test 40
11. Mean Score and t-value for differences between sexes based on the O-level mathematics grade 40
12. Mean Score and t-value for difference between sexes based on the Continuous Assessment marks 41
13. The mean Score and t-value for difference between sexes based on Teaching Practice 41
### LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>14.</td>
<td>Occupation of Parents</td>
<td>43</td>
</tr>
<tr>
<td>15.</td>
<td>Who paid students school fees</td>
<td>43</td>
</tr>
<tr>
<td>16.</td>
<td>Schools attended</td>
<td>44</td>
</tr>
<tr>
<td>17.</td>
<td>Achievement in Mathematics</td>
<td>44</td>
</tr>
<tr>
<td>18.</td>
<td>Performance in Methodology Test</td>
<td>45</td>
</tr>
<tr>
<td>19.</td>
<td>Type of School attended and Performance in mathematics Achievement</td>
<td>45</td>
</tr>
<tr>
<td>20.</td>
<td>Types of School attended and performance in methodology paper</td>
<td>46</td>
</tr>
<tr>
<td>21.</td>
<td>Statement with Positive Attitude</td>
<td>47</td>
</tr>
<tr>
<td>22.</td>
<td>Statements with negative Attitude</td>
<td>48</td>
</tr>
<tr>
<td>23.</td>
<td>How you found mathematics at Secondary School</td>
<td>49</td>
</tr>
<tr>
<td>24.</td>
<td>In which form did you find mathematics very difficult</td>
<td>49</td>
</tr>
</tbody>
</table>
1.0 INTRODUCTION

The purpose of this study is to find out factors that affect the achievement of prospective primary school teachers in Teacher Training Colleges. According to the Kenya National Examinations Council (1982) the performance of Mathematics at all levels has been poor. At the C.P.E. now (K.C.P.E.) level 59.1% in Rural Schools and 52.8% Nairobi Schools in 1982 results failed in Mathematics. This has far reaching implications on the development of mathematics in later years of schools. Table 1 shows the grimness of the situation.

**TABLE 1**

Mathematics Performance in C.P.E. Percentage Pass in Six Years

<table>
<thead>
<tr>
<th>TYPE OF SCHOOLS</th>
<th>YEARS</th>
<th></th>
<th></th>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Rural Schools</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>49.6</td>
<td>48.1</td>
<td>40.9</td>
<td>45.5</td>
<td>43.7</td>
<td>51.3</td>
</tr>
<tr>
<td>NAIROBI SCHOOLS Excluding High</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cost and Private Schools</td>
<td>47.6</td>
<td>46.8</td>
<td>41.8</td>
<td>44.2</td>
<td>42.2</td>
<td>51.7</td>
</tr>
<tr>
<td>NATIONAL AVERAGE MARK</td>
<td>48.6</td>
<td>47.5</td>
<td>41.4</td>
<td>44.9</td>
<td>43.0</td>
<td>51.5</td>
</tr>
</tbody>
</table>
Table 1, shows that the average Pass mark in mathematics indicates among other things that the pupils were not properly prepared in mathematics by their teachers. This leads to a very basic question, "Are the teachers themselves competent enough to teach mathematics in our Primary Schools?".

Analysis of the K.C.E. mathematics of 1982 reveals that their performance is significantly poor and it is from this population that prospective primary school teachers will be selected.

Table 2 indicates the performance of K.C.E. for the two years 1981 and 1982.

**TABLE 2**

Mean Performance of candidates in Mathematics at K.C.E. Expressed as Percentage Pass

<table>
<thead>
<tr>
<th>CATEGORY OF SCHOOLS</th>
<th>HIGH COST SCHOOLS</th>
<th>MIDDLE COST SCHOOLS</th>
<th>LOW COST SCHOOLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>OVERALL PERFORMANCE</td>
<td>42.80</td>
<td>43.83</td>
<td>23.53</td>
</tr>
</tbody>
</table>

The table indicates poor performance in Mathematics in 1981 and 1982. The situation has not been better in all other years and if there is any change the variation has not been significant. The low cost schools that make up 81.24% of the total number of candidates in the country has an average
mark of 11.27 and 12.38% in 1981 and 1982 respectively. This is an indication of an extremely low standards of mathematics in the majority of the country's secondary schools.

Such a dismal performance is evidence because in 1981 only 25.86% of the candidates passed mathematics papers and in 1982 only 28.56% passed.

Performance in mathematics papers in teacher colleges is poor. The K.N.E.C. has said that 1980 a random sample of Ex-form four candidates was selected to identify some of the common difficulties experienced by candidates in answering the paper. It was found out that students performance in methodology paper the most important part of the mathematics syllabus remains very weak. The median mark for the paper of 14.0 shows many students have a very unclear idea of how they would go about presenting these topics to primary school children.

Only 40% of the candidates managed to pass the paper meaning about 60% of candidates failed in mathematics. It was found out that candidates score more in content and less or fail in methodology paper meaning that time during the training course is being devoted to teaching content at the expense of methodology.

Many students who are good in the subject (Maths) have a disorganised and haphazard approach to problem
solving situations. Finally most of them are not aware of the methods and strategies which they can use to pass this knowledge and skills onto primary children.

The findings indicate to what extent teachers are ill-equipped to improve mathematics standards in Primary Schools.

It is essential that the training course in mathematics in Teachers Colleges should be organised in such a way that these weaknesses are overcome. It would help if students with a reasonable mathematics background could be selected for Teachers Colleges.

Sex-differences in performance in mathematics; The Kenya National Examinations Council (1983) C.P.E. indicated that there is a big difference in performance between boys and girls in all the subjects, but mathematics has a bigger gap. Table III gives a summary of the difference.

<table>
<thead>
<tr>
<th>TABLE 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex difference in Performance at different Subjects</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>YEARS</th>
<th>1982</th>
<th>1981</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUBJECTS</td>
<td>BOYS</td>
<td>GIRLS</td>
</tr>
<tr>
<td>ENGLISH</td>
<td>51.14</td>
<td>47.84</td>
</tr>
<tr>
<td>SCIENCE</td>
<td>46.42</td>
<td>39.98</td>
</tr>
<tr>
<td>HISTORY</td>
<td>38.72</td>
<td>33.00</td>
</tr>
<tr>
<td>GEOGRAPHY</td>
<td>45.16</td>
<td>38.56</td>
</tr>
<tr>
<td>MATHEMATICS</td>
<td>52.08</td>
<td>42.64</td>
</tr>
</tbody>
</table>
Table III shows differences in performance in C.P.E. 1981 and 1982 in different subjects, mathematics is leading in having a wider gap. It is expected that the gap is wider at K.C.E. since only 30% of the candidates manages to score points between (1-8) and the rest score 9 points or fail in mathematics.

In most of the low cost schools, it was difficult to know where the candidates went wrong. Where even the first step was wrong. They even lack the basic terminologies used in mathematics, let alone their application (Table 2).

It can be assumed that due to this poor performance in mathematics is the major course of constant curriculum changes in the subject in this country. We are caught up in a vicious circle in the subject as prospective teachers, come out to lay poor foundation, big percentage pupils fail in the subject and we train them to teach mathematics.

It was with such information as indicated above plus many others not included that this research project was primarily concerned. The question here is that: Who is actually responsible for poor performance in mathematics? Who do we blame for it?

Other scholars aired their views on the subject. Eshiwani (3, 1976) said that many of the Primary School Mathematics teachers are poor in the subject. As a consequence of these points it is possible that mathematics
is poorly taught and learned in Primary Schools. The result of this would be poor performance in mathematics tasks at all levels in Primary Education. He also blames the teachers and the books that are used in the teaching of mathematics for negative attitude towards the subject. Muhandik (15, 1984) recommended a further research study on the training of the teachers of mathematics in teaching methodology.

The researcher has the opinion that the findings from this study will be of great help to the curriculum developers at Kenya Institute of Education (K.I.E.), Ministry of Education, Science and Technology and Educators at teacher training colleges. The findings in addition will explain areas requiring further research in proper ways of training mathematics teachers for Primary Schools in this country.

1.1. STATEMENT OF THE PROBLEM

1.1.0 History of the problem.
There has been a public outcry concerning poor performance in mathematics at all levels of our Educational System. Statements such as they did very well except in mathematics are very common among people when the results are released, by Kenya National Examinations Council, (K.N.E.C.).
This has been backed by public struggle for better schools for their children in standard one and form one places all over the republic. It is further supported by statistics released by (K.N.E.C.) of C.P.E. now (K.C.P.E.) and K.C.E. where performance depended very much on the type of school the child attended.

As children go through the primary school mathematics curriculum, secondary school mathematics, they develop certain attitude towards mathematics and factors that might hinder their achievement in the subject. The researcher therefore expected those who performed very well at K.C.E. and C.P.E. will continue to do the same at Teacher Training Colleges.

1.1.1. Statement of the Problem

The problem of this study was selected in such a way that it could find out the performance of prospective teachers at Teachers Training Colleges right from C.P.E. and K.C.E. results, socio-economic background, sex-differences and attitudes towards mathematics. The problem reads "A Study of Factors that Affect Prospective Primary School Teachers Achievement in Mathematics".
1.2. PURPOSE OF THE STUDY
The purpose of the proposed study is to investigate the extent to which the following factors affect the achievement of prospective Primary School teachers in Mathematics:

1. Previous performance in Mathematics at the C.P.E. and K.C.E. level affect the performance of prospective teachers at Teacher Training College.

2. Males have high achievement in mathematics at T.T.C. than the female prospective teachers.

3. Student teachers background including schools previously attended have an effect on (his/her) achievement in mathematics at the college.

4. Attitudes towards mathematics affects the prospective teachers achievement in mathematics.

1.3. HYPOTHESES OF THE STUDY.
The following Null Hypotheses were tested in the study.

$H_0$: Previous performance in mathematics at the C.P.E. and K.C.E. level does not affect the performance of prospective teachers in mathematics at T.T.C.
H02 There is no difference in achievement and methodology in mathematics at T.T.C. between male and female prospective teachers.

H03 Student teachers background including previous schools attended has no relationship with achievement in mathematics at T.T.C.

H04 Attitude towards mathematics does not affect the performance in mathematics.

THE VARIABLES IN THE STUDY

1.4.1. The dependent variable in this study were the following:

(a) Scores achieved in the achievement test.
(b) Scores achieved in the methodology test.
(c) Scores achieved in the continuous Assessment test.
(d) Scores achieved in the Teaching Practice by marks out of 100%.
(e) Scores achieved at K.C.E. and C.P.E. mathematics grades.

1.4.2. The independent variables in this study were as follows:

(a) Sex of the student teacher: There were 111 male and 109 female student teachers who were included in the sample.
(b) Previous Schools: The students came from all over the republic, which played a major role in their achievement.
(c) Difference in Years: The sample included 1st year, 2nd year and one class who had already graduated from the Colleges.

1.4.3. Intervening Variables

At the time of conducting this research there were some intervening variables that were very difficult to control that may have had a significant influence upon the dependent variables:

(a) Attitude of the Student teachers: This affected the performance of the students as many of them did not like the idea of maths test, not even waiting to see the test itself.

(b) Types of previous schools attended: Majority of the students were from low cost or Government aided schools that had very poor background of mathematics.

(c) Colleges Schedules: At the time of the study Colleges were involved in music festival and colleges Athletics Championship so students who were involved were not keen in doing an impromptu tests.
1.5. LIMITATION OF THIS STUDY

1.5.1. Limitation on the choice of colleges

The M.Ed(P.T.E.) course is structured in such a way that only a relatively short time is available for one to conduct the research project. As a result, the choice of the Primary Teachers Colleges was limited to three only. The colleges were chosen from Nairobi and Kiambu Districts. These were Highridge, Thogoto and Kilimambogo Teacher Training Colleges. With this constraint, the researcher was of the view that a better generalization would have been achieved if a wider area had been covered rather than the three colleges named above out of 15 colleges in the Republic.

1.5.2. Limitation on the time available for testing

There is only two months to gather, analyse, compute and come up with findings. Therefore the researcher has decided to take 33% of the total population of colleges in the country for this study. Locating the time for testing and data collection was a real problem as most of the students were involved in other subjects. The conditions were that the time must be a maths time and be a double period with another period from the willing donor. In all a total of 3 periods continuously was required for the study.
1.5.3 Limitation on the choice of Respondents

Because of limited funds and time the researcher chose randomly respondents by class e.g. from first year group ID and 2nd year students 2F participated in the study. A total of 9 tutors 3 from each college participated in the study. The condition was that there must be tutors of the involved classes and a head of mathematics Department.

The researcher also collected from one class from each college who had graduated and had their O-level mathematics, Teachers Examination mathematics results, and teaching practice marks. This was to give a good comparison of the students performance at O-level, teachers examination and corresponding teaching practice results.

1.5.4 Limitation on the Availability of related Literature

This is the study of its own kind in Kenya. There are several studies that focus their attention to the general training of teachers but none - has focussed his attention on training of mathematics teachers under Mathematics Education. Hence there is very little literature to be reviewed as this topic is concerned.
However, there is a lot of literature in Daily Newspapers based on mathematics performance and curriculum changes.

1.5.5. Limitation on the Pre-testing the materials

There was no time to do pilot testing before embarking on the main project due to lack of enough time and money. This made it difficult to print materials for piloting. It was not also possible to travel to areas where the study had been scheduled. Many principals would not have allowed long interruptions to their students.

1.6. ORGANIZATION OF THE STUDY BY CHAPTERS

In this section, the researcher gives a summary of the contents in the subsequent chapters. Chapter II Focuses on the review of the literature relating to the research questions.

Chapter III

This deals with the methodology and design of the study. It gives a description of the research sample and its selection. Methods and procedure for the administration of the questionnaires.
Chapter IV: Consists of the analysis and interpretation of the data collected. Given here is also the various methods of data analysis.

Chapter V. This deals with the summary of the findings, conclusions, implications and recommendations for further study.
2.0 INTRODUCTION

There has been a lot of public outcry about the poor performance in mathematics by their children. However, these complaints are based on the actual results of mathematics as compared to other subjects in the examination in the same year. These problems are aired in the Daily Newspapers, magazines and Articles, but die out after a short time after the release of the results by Kenya National Examination Council (K.N.E.C.).

As pointed out in (1.5.4) above there are few literature based on the causes of these failures, despite this the ones available tries to blame the teachers as the responsible for the poor performance in Mathematics.

Learning in general is governed by very many factors, some of which affect it favourably and others adversely. This Chapter is devoted to review of literature in many areas dealing with factors that may be affecting the achievement of prospecting Primary School teachers in Mathematics.

It is also important at this point to note that mathematics curriculum has changed three times in the last two decades. Unfortunately when the change is announced
nobody prepared the teachers for the changes, materials were lacking and cost involved were too high.

2.1. LITERATURE RELATED TO TEACHERS EDUCATION

Teachers Education in Kenya has not been given the attention it deserves. They have been just handpicked and taken to classroom to teach with or without required training.

"The curriculum to which Primary School teachers are exposed to in Kenya makes nonsense of any meaningful discussion of the subject of effective teaching. It is the standardised one handed down from the Ministry of Education, Science and Technology and is based on the Urban situation; it is usually assumed that what will work in one setting will automatically work in another:" Sifuna (1982)¹

This means that teachers are not aware of what to teach but are given the curriculum to teach whether they understand it or not does not matter. This is understandable considering the category of schools given in Chapter One and results they get.

African Educational Commission Report (Beecher Report, (1949)² indicated that, the lack of trained staff through out the schools and the poor quality of what trained staff there was, had combined to impose in Schools a mediocre low level of performance. The great mass of those who completed standard five tested in an examination achieved
results so closely alike that proper selection for admission to the secondary schools was almost impossible.

The Kenya Education Commission Report (Ominde Report) of 1964 remarked that unless steps were taken to up-grade the proportionately high numbers of P3 teachers (Primary School leavers), these would continue to determine the standards of the Primary Schools.

The Report of the National Committee of Educational objectives and policies of (1976) recommended that: To require an E.A.C.E. pass for the future Secondary School Leaving Certificate in Mathematics as a minimum requirement to Primary teacher training. This report as early as 1976 the commissioners had recognised the problem of training prospective teachers of primary schools who have failed in mathematics.

According to Mr. B.M. Nyaga and Mr. Mberia, they argue that the poor results in mathematics are due to the negative attitudes and value our society gives to mathematics, so this scares the teachers as well as their students. They agree that mathematics is poorly taught in most secondary schools by teachers. They recommended that for Primary teacher training colleges should only accept those students with at least Credit 6 in mathematics for then to be trained as mathematics teachers in our primary schools, otherwise the standards of mathematics will continue to be poor.
This is a very important stage where mathematics foundation is being laid and should only be done by those who are capable in the subject. Mr. B.M. Nyaga is the Headmaster of Nairobi School and Chief Examiner of Paper two mathematics O-level (K.C.E.) since 1974. Mr. Mberia is the Dean of Students at Jomo Kenyatta College of Agriculture, author of O-level mathematics books and assistant chief examiner to Mr. Nyaga.

"Mathematics is an essential part of man's daily life. Despite this importance it has been christened a very difficult subject by pupils, teachers and even society at large. Munyiilu (16, 1985).

"Many of the Primary School mathematics teachers are poor in the subject. As a consequence of these points it is possible that mathematics is Poorly taught and learned in Primary Schools. The results of this would be poor performance in mathematics tasks at almost all levels in Primary Education. He also blames the teachers and the books that are used in the teaching of mathematics for this negative attitude towards the subject: Eshiwani (1976) further says that there are over 70% failures in the subject at O-level and the implication of this is not good for the country: He emphasises that the teaching materials must have a spiral effect, meaning that, it must be designed to revolve around the child, take him from stage to stage over the years, accumulating into a coordinated programme." Eshiwani (1986).  

Many students do not comprehend mathematics and there is in fact a wide spread fear among children and adults sometimes referred to as "Number anxiety" concerning their ability to cope with its subject matter. More than any other
discipline studied in the school, mathematics requires that the learner understands along sequentially related and hierarchically organised systems of propositions (Ausubel and Robinson (2, 1976).

The researcher has the opinion that a good mathematics teacher should be aware of the content and methods of presentation. Similarly lack of psychological knowledge will make him unaware of the order of teaching a given mathematical topic and individual differences among the pupils.

Muhandik (14, 1984) recommended a further research study on the training of the teachers of mathematics in teaching methodology.

Mary Catherine Hudspeth (12, 1978) pointed out that throughout the country murmuring were swelling into a din "college students know no Algebra", "They are intimidated by percents". Further she observed that the pressure to maintain enrollment high has meant that these less well prepared students have gradually become incorporated into the student population each year in an increasing numbers.

The Kenya National Examination Council Newsletters for mathematics performance at C.P.E., K.C.E. and Teachers Examination (P.T.E.) are poor. It indicated that in 1981 and 1982, the low cost schools that make up 81.24% of the total number of candidates in the country has an average
mark of 11.27 and 12.38% respectively at K.C.E.
This is an indication of an extremely low standards of mathematics in the majority of the country's secondary schools.

Performance in mathematics papers in Teachers Colleges is poor. The (K.N.E.C.) has said that in 1980 Ex-form four candidates performance in methodology paper the most important part of the mathematics syllabus remains very weak. The median mark for the paper of 14.0 shows many students have a very unclear idea of how they would go about presenting these topics to primary school children. Kenya National Examination Council Newsletter (1980, 81, 82).

Observing the quality of students recruited for Primary teacher education, it was seen that though the profession is increasingly beginning to attract students who generally perform well in the Kenya Certificate of Education (K.C.E.), their performance on the key subjects like Mathematics, English and Science is poor. These are some of the subjects considered for recruitment in several other jobs and are important in the certificate of Primary Education (C.P.E.), Sifuna D. (1982)¹.

A study carried out on a related subject of Examination concluded that those recruited in Primary teaching are those who did not perform highly. Sifuna, D.N. (1977)⁶
Castle making a similar observation in 1966 concluded that: "In any discussion of the education of young teachers it must be borne in mind that almost every training college student is a failed candidate for the academic high school or the university. He does not therefore enter the college with the most appropriate aspirations for he starts his training for a difficult career wishing he were elsewhere." Castle (1966)

A study carried by Renes at Butimba Teacher Training College in Tanzania supported the academic achievement as a factor in the prediction of Teaching effectiveness. He concluded that:

"... not only is it apparent that the qualifications based on the results of the final form four secondary examination provides a fairly trustworthy future career at T.T.C. but also very clearly that those who actually fail this examination must not be considered for a teachers training course". Renes (1966)

This finding is in line with Mr. Nyaga's and Mberia's statement that the students need to have a credit in mathematics to be trained as a mathematic teacher for primary schools.

The researcher has the opinion that studies in this topic are not conclusive and more work is called for.
2.2. LITERATURE RELATED TO SEX DIFFERENCES

Many research conducted in the recent years revealed that males perform better in mathematics than the females on the average. But Wamani (1980)\(^9\) in his research found out that there is no sex difference between boys and girls in the mathematical abilities of the class range std. 3 to std. 5. This could be true because he studied children of under 13 years of age where sex difference has not come out very clearly. However, his study contradicted earlier studies in the sex differences.

Between nine and thirteen years, Maccoby's (1966)\(^{10}\) review found that sex difference when found were usually in favour of boys. After the age of thirteen the results of most studies became more constant in their findings and boys are almost invariably found to be superior. Toka (1978)\(^{11}\) noted significant sex difference in favour of boys in Arithmetic reasoning ability. He also noted the significant difference in attitudes towards mathematics in favour of boys noted in the same study might have accounted for the superiority of boys in arithmetical reasoning.

Eshiwani (1975)\(^{12}\) did a study on sex difference in the learning of mathematics among Kenyan High School students revealed that, in general, these form II Kenyan boys have more positive attitude towards mathematics than girls and
that boys scored higher on tests of mathematical reasoning computation and comprehension of mathematical and scientific terms. He further says that:

"what is crucial in the achievement and the retention of Kenyan boys and girls in mathematics is not their attitudes towards mathematics or expectations of their sex roles but the method used in instruction".

He concludes that although sex difference can be observed in Kenyan High School students, they can not be attributed to the attitudes of the students or to cultural expectations for males and females. Instead, the method of instruction seems the most important influence on achievement and retention. The researcher did the study to find out whether there is a sex difference in performance among prospective Primary School teachers in mathematics.

2.3. LITERATURE RELATED TO ATTITUDES TOWARDS MATHEMATICS

An attitude is a mental and neural state of readiness, organised, through experience exerting a directive or dynamic influence upon the individual response to all objects and situations with which it is related. Bell (1980)\textsuperscript{13}

Attitudes are fundamental to the dynamics of behaviour. They largely determine what students learn. Attitudes determine not only his willingness to study mathematics but also his use of mathematics as well. Johnson, and Rising, (1972)\textsuperscript{14}. He further says that the development
of positive attitudes towards mathematics is fundamental concern of the mathematics teacher. And it is often the attitudes you built that are the basis for your rank as a successful or unsuccessful teacher.

Denovan A. Johnson (1957)\textsuperscript{15} says that:

"If a student develops a positive attitude then the chances of his liking the subject and at the same time performing well are increased."

Johnson went on to stress his point by this example:

If the attitude of appreciation of mathematics is attained by a student, then he studies mathematics because he enjoys it, he gets satisfaction from knowing mathematics ideas; he feels rewarded when he attains mathematical competency.

Harold H. Lerch also expressed similar views but suggested that teachers had a big responsibility in designing instructional materials and strategies that would help promote positive attitudes in the classroom. Lerch (1960)\textsuperscript{16}

It is important to note that whereas these researchers felt that the learning situation should be a pleasant one, Mager, (1966)\textsuperscript{17} was quick to point out that:

"It is not necessary that lessons be "fun" and that the student should be required to work hard."

He highlighted his point when he stated that the matter of attitudes towards mathematics needs additional study. It would be helpful to explore various avenues that might
lead to changes in attitudes and also to explore the
effect of changed attitudes on study habits and achieve-
ment in mathematics (Fannie)\textsuperscript{18}

Lyda and Morse (1962)\textsuperscript{19} conducted an experimental
study using two classes of fourth grades. One group was
taught by the regular teacher using normal curriculum
materials and the other group was taught by one of the
experimenters using twenty one specially prepared lessons
that were taught using meaningful methods. These meaningful
methods involved stressing the mathematic methods involved
stressing the mathematic aim of arithmetic such that the
instructor stressed the concept of numbers, the understanding
of our numeration System and place of value, the use of
fundamental operations, the rational of computational
operations, the rational of computational forms and the
relationships which make arithmetic a system of thinking.
The results of this study led the authors to conclude that:

(1) when meaningful methods of teaching
Arithmetic are used, changes in attitudes
towards arithmetic take place. Negative
attitudes become positive and the intensity
of positive attitudes becomes enhanced.

(2) Associated with meaningful methods of
teaching arithmetic and changes in attitudes
are significant gains in arithmetic achievement,
that is computation and reasoning.
Brassham, et al. (1964) found that four times as many pupils with poor attitudes toward arithmetic were classified as .65 grade level below expected achievement as those who were classified as .65 grade level above expected achievement. Almost three times as many high attitude pupils over-achieved 0.65 grade as under-achieved that amount. Differences were significant at the 0.02 level of confidence. A similar division was also obtained using plus and minus 0.4 grade as the criteria of over and under-achievement. This difference was significant at 0.01 level of confidence.

This variability led the researchers to conclude that prediction of achievement on the basis of the attitude score for individuals would be somewhat risky.

From the literature above, the researcher has the opinion that there is no general consensus that a child's attitude toward learning arithmetic is important. However, studies in attitudes have not been conclusive.
CHAPTER THREE
RESEARCH DESIGN AND METHODOLOGY

3.0. INTRODUCTION

The purpose of this Chapter is to provide a guideline on the procedures utilized in the implementation of this study. The respondents were prospective teachers who enrolled at the Primary teacher colleges to be trained as P1 teachers and must be ex-form fours. The researcher was trying to look for factors that affect prospective teachers' achievement in mathematics. It was designed to look for these factors in relation to previous performance in mathematics at earlier levels of Education, sex difference in performance, students' background and schools previously attended and finally attitudes towards mathematics.

A variety of instruments were deployed to find solutions to the problems above.

This Chapter is composed of:

1. Research Sample and its Selection
2. The Research Instruments
3. Methods and Procedures for test Administration
4. Data Coding
5. Scoring the Questionnaires.

3.1. RESEARCH SAMPLE AND ITS SELECTION

The population of this study were those students who were drawn from 3 colleges randomly selected from a
population of fifteen colleges who offer P1 training for prospective teachers in Primary Teacher Colleges. The Colleges were Highridge, Thogoto and Kilimambogo which offer teaching courses to students with form four standard of Education. Each college has a population of about 840 students divided into 24 classes, 12 classes for each year. This gave a total of 2520 students out of which 220 students participated in the study. Originally the researcher had chosen classes "ID" and "2F" to participate in the study but due to unforeseen circumstances it did not happen that way. At Highridge College 1A, 1B and 2F, at Thogoto 1B and 2M, while at Kilimambogo IG and 2F classes participated in the study. The reason for the change was that the identified classes could not be available by the time the researcher visited the college.

The researcher also collected the data for Class 2C in all the three colleges. These were old students who graduated in 1985 March and the results for both O-level and P.T.E. mathematics were available for comparison.

The mathematics tutors who teach the above classes and the head of mathematics Department were interviewed about the general set up of mathematics teaching and learning. Their students performance and achievement in mathematics. The result will be discussed later in Chapter Four.
3.2. THE RESEARCH INSTRUMENTS

The researcher used two types of instruments.

3.2.1. Student Questionnaire Form.

This was divided into 2 sections:

Section A. This was concerned with finding out the information about the student background, e.g. sex, previous schools attended, previous performance in mathematics, how he rates mathematics among other subjects and how he feels about mathematics. The section was having 27 items.

Section B. This was to find out the attitudes of students towards mathematics. There were 28 items each followed by five point response. The responses were 1. Strongly Agree (SA), 2. Agree (A) 3. Neutral (N) 4. Disagree (D) and 5. Strongly Disagree (SD). The 14 statements were positively worded and 14 were negatively worded.

3.2.2 Achievement test in mathematics.

This was also composed of 2 sections:

Section A: This contained 40 problems each with five choices of responses. The student was to select the best answer out of these five alternatives after working out the problem. The questions were testing
simple use of mathematical operations covering all sections usually taught at T.T.C.

**Section B:** This section carried 20 problems to be responded to. The questions were the ones usually asked in the methodology section. All the questions were already taught to all the students involved in the study by the time of research.

The time allowed for the two questionnaires was 2 periods of 80 mins. but could be extended for slow students for the whole of appendix B.

### 3.4 METHODS AND PROCEDURE FOR TEST ADMINISTRATION

The researcher wrote letters to the Principals of the concerned colleges asking them for permission to conduct a research in their institutions. The Principals in turn were requested to inform the Head of Mathematics Department, the tutors concerned and the students of classes 1D and 2F.

A visit was then paid to each college and final arrangements were made, on the agreed date and time the researcher would visit the college, taken to class by the class tutor who introduced the researcher to the students and the purpose of the visit. The researcher
would be left to explain to the students what they were expected to do. After this the students were left to do the exercise and ask the questions where they could not understand.

The students started with Appendix A for the first 20 mins. and continued to Appendix B for the rest of the time. The appendix A was collected before Appendix B was given out.

The exercise took a maximum of 2 hours continuously. There was no break allowed but the students were allowed to go out should there be a need to do so and come back to continue with the test. The reason for this was to avoid cheating in the achievement and methodology tests.

The researcher collected all the question papers, rough papers at the end of 3rd period or when 2 hours were over, thanked the students for their cooperation. On the first day the researcher gave out interview schedule to tutors in the form of a questionnaire to fill in inorder to save time. The Dean of Students gave out the information about students marks and records concerning continuous assessment, Teaching Practice, O-level grades in mathematics and the division they obtained in form four.

After taking all the necessary information required, the researcher thanked all the people involved, students, tutors, and the Principal then left for the next College. This was done in all the three colleges.
3.5 DATA CODING.

The table 4 gives the summary of the codes used in the study.

**TABLE 4**

<table>
<thead>
<tr>
<th>NAME OF COLLEGES</th>
<th>CODE OF COLLEGE</th>
<th>CODE OF COLLEGE</th>
<th>CODE OF COLLEGE</th>
<th>CODE OF COLLEGE</th>
<th>CODE OF COLLEGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIGHRIDGE</td>
<td>H</td>
<td>H001-H100</td>
<td>H221-246</td>
<td>HM</td>
<td>HF</td>
</tr>
<tr>
<td>THOGOTO</td>
<td>T</td>
<td>T101-161</td>
<td>T247-273</td>
<td>TM</td>
<td>TF</td>
</tr>
<tr>
<td>KILIMAMBOGO</td>
<td>K</td>
<td>K162-220</td>
<td>K274-304</td>
<td>KM</td>
<td>KF</td>
</tr>
</tbody>
</table>

The table 4 indicates that there were 100 students from Highridge, there were 61 students from Thogoto and there were 59 students from Kilimambogo who were 1st and 2nd year respectively. HM stands for Highridge male students and HF stands for Highridge Female student.

H1-3 means that there were 3 tutors who responded to the interview schedule at Highridge.

Table 5 gives sex distribution for those who participated in the study.
TABLE 5

<table>
<thead>
<tr>
<th>SEX: CLASS</th>
<th>H</th>
<th>T</th>
<th>K</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>MALES</td>
<td>20</td>
<td>17</td>
<td>8</td>
<td>14</td>
</tr>
<tr>
<td>FEMALES</td>
<td>17</td>
<td>18</td>
<td>22</td>
<td>14</td>
</tr>
<tr>
<td>CLASS TOTAL</td>
<td>37</td>
<td>35</td>
<td>30</td>
<td>28</td>
</tr>
</tbody>
</table>

Table 5 exclude the total number of old students who graduated in 1985 March, they totalled 51 males and 33 females which gives a total of 84 former students. Also included in the study were a total of 10 tutors from the three colleges, table 4.

3.6. SCORING OF THE QUESTIONNAIRES

The students were to give all responses required. The achievement test was marked manually, using the marking scheme. The correct response was awarded 1 mark, incorrect response was awarded 0 mark, and no response was given 9. It was an uphill task and consumed a lot of time.

Section A of Appendix B was marked out of 40 and Section B was marked out of 20 termed as achievement and methodology respectively.
Appendix A both the sections each item was treated on its own merit. The attitude scale responses were reduced to three. SA and A were treated as Agree (A), Neutral (N) was left as undecided candidate and D and SD were treated as Disagree (D).
4.0 INTRODUCTION

It was pointed out in Chapter One the problems that made this study to be set. The researcher conducted a "Simple Survey" type of research. The findings of this research were therefore derived from what the researcher himself found in the field through interviews and the responses the prospective teachers gave in the questionnaires at the time of the study.

The purpose of this study was to investigate the factors that affect the prospective teachers' achievement in mathematics at Teachers Training Colleges.

The set Null-hypothesis were tested by a non-directional (two-tailed) t-test with unequal n. for $H_{01}$. Previous performance in mathematics at the C.P.E. and K.C.E. level does not affect the performance of prospective teachers achievement in mathematics, and $H_{02}$. There is no difference in achievement in mathematics at T.T.C. between male and female prospective teachers.

The two-way analysis of variance (ANOVA) was carried out to test the Null-hypothesis concerning student teachers background including schools previously attended. Lastly, Attitudes towards mathematics was tested by averages, means and standard deviation from the student responses to 28
items given in Appendix A. This was then compared to the actual tests given to the students in class. In each of the three cases, the level of significance was evaluated at $P \leq 0.05$ and $P \leq 0.01$. If the calculated "F" or "t" values were greater than the theoretical "F" or "t" values at the given degrees of freedom, then the Null-hypothesis $H_0$ was rejected.

In each case the means and standard deviation of scores were calculated to give average value and the spread of the values of the observations.

A calculation providing frequencies for all the variables and a cross tabulation of means for the most significant variables were used.

1. PREVIOUS PERFORMANCE IN MATHEMATICS

To test the previous performance in mathematics at the C.P.E. and K.C.E. against the performance at T.T.C. (P.T.E) Primary Teachers Examination (mathematics). The t-test was used. The tables 6 to 8 gives the frequency of performance and the findings.
<table>
<thead>
<tr>
<th>GRADE OBTAINED</th>
<th>NUMBER OF CANDIDATES</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>48</td>
<td>21.8</td>
</tr>
<tr>
<td>B</td>
<td>76</td>
<td>34.5</td>
</tr>
<tr>
<td>C</td>
<td>58</td>
<td>26.4</td>
</tr>
<tr>
<td>D</td>
<td>2</td>
<td>0.9</td>
</tr>
<tr>
<td>E</td>
<td>5</td>
<td>2.3</td>
</tr>
<tr>
<td>F</td>
<td>14</td>
<td>6.4</td>
</tr>
<tr>
<td>NA</td>
<td>17</td>
<td>7.7</td>
</tr>
<tr>
<td>TOTAL</td>
<td>220</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Mean = 2.927 and Standard Deviation (STD DEV) = 2.265.

The Table 6 indicates that only 56.3% were the ones who qualified to do mathematics at Secondary Schools, the rest were considered as failures in mathematics.

<table>
<thead>
<tr>
<th>GRADE POINTS</th>
<th>NO. OF CANDIDATES</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>DISTINCTION 1-2</td>
<td>1</td>
<td>0.5</td>
</tr>
<tr>
<td>CREDIT 3-6</td>
<td>74</td>
<td>33.6</td>
</tr>
<tr>
<td>PASS 7-8</td>
<td>74</td>
<td>33.6</td>
</tr>
<tr>
<td>FAIL 9</td>
<td>71</td>
<td>32.3</td>
</tr>
<tr>
<td>TOTAL</td>
<td>220</td>
<td>100.0</td>
</tr>
</tbody>
</table>
mean = 3.050
STD.DEV=1.082

Table 7 indicates that a large number of prospective teachers only get a pass in mathematics at K.C.E. taking into account that 32.3% had totally failed in mathematics.

Hypothesis 1

Previous performance in mathematics at the C.P.E. and K.C.E. level does not affect the performance of prospective teachers in Mathematics at Teacher Training College T.T.C.

Results:

The following t-test results were computed:

Table 8: Total mean scores and t-values for difference between O-level and Teachers Examination mathematics results.

<table>
<thead>
<tr>
<th>O-Level (N=84)</th>
<th>P.T.E. (N=84)</th>
</tr>
</thead>
<tbody>
<tr>
<td>X1</td>
<td>X2</td>
</tr>
<tr>
<td>7.595</td>
<td>3.595</td>
</tr>
</tbody>
</table>

** Indicates P < 0.01
4.2. SEX DIFFERENCE IN PERFORMANCE

Due to various studies in sex difference in mathematics, the researcher wanted to find out areas where this difference occur among the prospective Primary School Teachers. The following areas were tested. These include: Achievement in mathematics, methodology in teaching mathematics, Grades obtained at K.C.E. in mathematics, Continuous Assessment in mathematics at T.T.C. and Teaching Practice marks. The results are given in tables 9 to 13.

Hypothesis 2.

H₀₂ There is no difference in achievement in mathematics at T.T.C. between male and female prospective teachers.

Results:
The following t-test results were computed on each topic.

TABLE 9
(a) Mathematics Achievement test
Mean scores and t-value for differences between sexes based on the Achievement test

<table>
<thead>
<tr>
<th></th>
<th>Male (N=117)</th>
<th>Female (N=101)</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X₁</td>
<td>SD</td>
<td>X₂</td>
</tr>
<tr>
<td></td>
<td>26.950</td>
<td>7.114</td>
<td>22.950</td>
</tr>
</tbody>
</table>

** Indicates P < 0.01
b) Methodology test.

**TABLE 10**

Mean Score and t-value for difference between sexes based on the Methodology Test

<table>
<thead>
<tr>
<th>Males (N=117)</th>
<th>Female (N=101)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$X_1$</td>
<td>$X_2$</td>
</tr>
<tr>
<td>S.D.</td>
<td>S.D.</td>
</tr>
<tr>
<td>7.299</td>
<td>6.118</td>
</tr>
<tr>
<td>3.094</td>
<td>3.019</td>
</tr>
</tbody>
</table>

$t = 2.844^{**}$

Results ** Indicates $P \leq 0.01$

c) O-Level mathematics grade.

**TABLE 11**

Mean Score and t-value for difference between sexes based on the O-level Mathematics grade

<table>
<thead>
<tr>
<th>Males (N=116)</th>
<th>Females (N=100)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$X_1$</td>
<td>$X_2$</td>
</tr>
<tr>
<td>SD</td>
<td>SD</td>
</tr>
<tr>
<td>6.672</td>
<td>7.71</td>
</tr>
<tr>
<td>1.865</td>
<td>1.705</td>
</tr>
</tbody>
</table>

$t = 5.679^{**}$

Results ** Indicates $P \leq 0.01$
d) Continuous Assessment marks for 2nd Years only.

**TABLE 12**

Mean Score and t-value for difference between sexes based on the Continuous Assessment marks

<table>
<thead>
<tr>
<th></th>
<th>Males (N=44)</th>
<th>Females (N=45)</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\overline{X}_1$</td>
<td>56.227</td>
<td>50.733</td>
<td>1.953</td>
</tr>
<tr>
<td>SD</td>
<td>12.156</td>
<td>14.156</td>
<td></td>
</tr>
</tbody>
</table>

e) Teaching Practice marks for Second Years only.

**TABLE 13**

The mean score and t-value for difference between sexes based on the Teaching Practice Marks

<table>
<thead>
<tr>
<th></th>
<th>Males (N=43)</th>
<th>Female (N=43)</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\overline{X}_1$</td>
<td>66.325</td>
<td>67.325</td>
<td>0.588</td>
</tr>
<tr>
<td>SD</td>
<td>9.745</td>
<td>5.589</td>
<td></td>
</tr>
</tbody>
</table>

From the results above a, b, and c indicates that the males are superior in performance in mathematics than the females. The difference is highly significant at $P < 0.01$. However, the results d and e indicates that there is no significant difference between the sexes.
in continuous assessment marks and Teaching Practice marks.

The reason for this could be that most of the continuous assessment tests are open tests and are subjects to cheating. Teaching Practice marks are also not trustworthy because most tutors do not want their candidates to fail hence good performance for all the candidates.

4.3. STUDENTS BACK-GROUND AND PREVIOUS SCHOOLS ATTENDED

This section attempted to examine a number of Socio-economic variables to obtain a general financial description of the students. The interest was focused on some of the indicators of social class, occupations of parents and type of schools they attended. Tables 14 to 20 gives the summary of the findings.

Hypothesis 3

$H_{03}$ Student teachers background including schools previously attended have no effect on his/her achievement in Mathematics at the Teachers Training College.

Table 14 indicates the occupation of students parents during their secondary education.
### TABLE 14

**Occupation of Parents**

<table>
<thead>
<tr>
<th>Types of Occupation</th>
<th>Total No.</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Both or one employed</td>
<td>28</td>
<td>12.7</td>
</tr>
<tr>
<td>Farmer or Peasant</td>
<td>106</td>
<td>48.2</td>
</tr>
<tr>
<td>Purely Peasant</td>
<td>66</td>
<td>30.0</td>
</tr>
<tr>
<td>Brother or sister employed</td>
<td>15</td>
<td>6.8</td>
</tr>
<tr>
<td>Others</td>
<td>5</td>
<td>2.3</td>
</tr>
<tr>
<td><strong>TOTAL NUMBER</strong></td>
<td><strong>220</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Table 15 indicates who paid the students school fees during their Secondary Education.

### TABLE 15

**Who paid students school fees**

<table>
<thead>
<tr>
<th>Who Paid</th>
<th>Total number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mother/Father</td>
<td>169</td>
<td>76.9</td>
</tr>
<tr>
<td>Brother/Sister</td>
<td>38</td>
<td>17.3</td>
</tr>
<tr>
<td>Uncle/Relatives</td>
<td>7</td>
<td>3.1</td>
</tr>
<tr>
<td>Charitable organisations</td>
<td>6</td>
<td>2.7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>220</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>
## TABLE 16

### Schools attended

<table>
<thead>
<tr>
<th>Type of School</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Cost Schools</td>
<td>6</td>
<td>2.7</td>
</tr>
<tr>
<td>Low Cost Schools</td>
<td>71</td>
<td>32.3</td>
</tr>
<tr>
<td>Government Aided Schools</td>
<td>98</td>
<td>44.5</td>
</tr>
<tr>
<td>Private Schools</td>
<td>14</td>
<td>6.4</td>
</tr>
<tr>
<td>Harambee Sec. Schools</td>
<td>24</td>
<td>10.9</td>
</tr>
<tr>
<td>Private Candidates</td>
<td>7</td>
<td>3.2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>220</td>
<td>100.0</td>
</tr>
</tbody>
</table>

For grades of O-level mathematics refer to table 7. Table 17 indicates performance in Mathematics achievement Test marked out of 40.

## TABLE 17

### Achievement in Mathematics

<table>
<thead>
<tr>
<th>Performance</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-19 Poor</td>
<td>101</td>
<td>45.9</td>
</tr>
<tr>
<td>20 -30 Fair</td>
<td>58</td>
<td>26.4</td>
</tr>
<tr>
<td>31-35 Good</td>
<td>44</td>
<td>20.0</td>
</tr>
<tr>
<td>36 - 40 Excellent</td>
<td>17</td>
<td>7.7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>220</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Table 18 indicates performance in teaching methodology test marked out 20

TABLE 18

<table>
<thead>
<tr>
<th>Performance</th>
<th>Total No.</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 10 Poor</td>
<td>199</td>
<td>90.5</td>
</tr>
<tr>
<td>11 - 15 Fair</td>
<td>19</td>
<td>8.6</td>
</tr>
<tr>
<td>16 - 18 Good</td>
<td>2</td>
<td>0.9</td>
</tr>
<tr>
<td>19 - 20 V. Good</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Total</td>
<td>220</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Results:

The following analysis of variance (ANOVA) were computed:

TABLE 19

<table>
<thead>
<tr>
<th>Source of variation</th>
<th>Sum of Squares</th>
<th>Degree of freedom</th>
<th>Mean squares</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between groups</td>
<td>59.6368</td>
<td>5</td>
<td>11.9274</td>
<td>**</td>
</tr>
<tr>
<td>within groups</td>
<td>539.0723</td>
<td>214</td>
<td>2.5190</td>
<td>4.7349</td>
</tr>
<tr>
<td>Total</td>
<td>598.7091</td>
<td>219</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Results ** indicates $P \leq 0.01$
TABLE 20
Type of School attended and performance in methodology paper

<table>
<thead>
<tr>
<th>Source of variation</th>
<th>Sum of Squares</th>
<th>Degree of Freedom</th>
<th>Mean Squares</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between groups</td>
<td>49.4787</td>
<td>5</td>
<td>11.9274</td>
<td>**</td>
</tr>
<tr>
<td>within groups</td>
<td>549.2304</td>
<td>214</td>
<td>2.5190</td>
<td>3.8557</td>
</tr>
<tr>
<td>Total</td>
<td>598.7091</td>
<td>219</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Results ** indicates $P < 0.01$

From table 14 only 12.7% of parents have assured salary income, the rest could be considered as having no fixed source of income. From table 15, 76.0% of the students indicated that their parents paid the school fees meaning there was a problem in raising the school fees. Conclusions can be drawn from Table 14.

Table 16 indicated that only 2.7% were from high cost schools, the rest were from low cost schools whose average marks in mathematics was 11.27% indicated in Chapter One.

Table 7 only 34.1% got point (1-6) at K.C.E. meaning that 65.9% are poor in mathematics. Table 17 indicated that 45.9% are poor in use of mathematical operations, the rest are good, this gives hope for prospective teachers in teaching the subject. Unfortunately Table 18 contradicts
this as it is indicated that 90.5% of prospective teachers are poor in the methodology paper. Therefore they are not able to communicate these operations to Primary School children. The null hypothesis $H_{03}$ was rejected on the basis of results from tables 15 and 16.

4.4. Attitude towards mathematics.

The attitude scale was administered during the data collection comprising of 28 items. Out of these 14 items were having positive attitude statement. The items on the scale were rated as follows:
1. Strongly Agree (SA), 2. Agree (A) were combined to read Agree (A), 3. Neutral (N) was left alone, and 4. Disagree (D) and strongly Disagree (SA) were combined to read Disagree (D).

Of the three cases percentages were computed and comparisons made.

| TABLE 21 |
| Statement with positive Attitude |

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agree</td>
<td>%</td>
<td>Neutral</td>
<td>%</td>
<td>Disagree</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Total Number</td>
<td>1489</td>
<td>677</td>
<td>583</td>
<td>267</td>
<td>1019</td>
<td>468</td>
</tr>
<tr>
<td>Mean $\bar{X}$</td>
<td>106.36</td>
<td><strong>48.00</strong></td>
<td>41.64</td>
<td>19.00</td>
<td>72.79</td>
<td>33.00</td>
</tr>
<tr>
<td>N=14 items</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The interest lies with columns 2, 4 and 6 in all cases. In table 21 positive statement 48% agreed with the statements 33% disagreed with the statement and 19% were undecided. We can conclude here that 48% had a positive attitude towards mathematics as compared to 33% who disagreed with a positive statement.

From table 22 statements with negative attitude we can see that 59% disagreed with the statement. From the given figures the researcher came to a conclusion that prospective teachers have a positive attitude towards mathematics.

When asked their feelings about mathematics during their Secondary Education table 23 gives the summary of their responses.

**TABLE 22**

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agree</td>
<td>%</td>
<td>Neutral</td>
<td>%</td>
<td>Disagree</td>
<td>%</td>
</tr>
<tr>
<td>Total Number</td>
<td>830</td>
<td>37.8</td>
<td>445</td>
<td>205</td>
<td>1788</td>
</tr>
<tr>
<td>Mean $\bar{X}$</td>
<td>59.28</td>
<td>27.0</td>
<td>31.79</td>
<td>14.00</td>
<td>127.14</td>
</tr>
</tbody>
</table>

$N = 14$ items
**TABLE 23**

How you found mathematics at Secondary School

<table>
<thead>
<tr>
<th>Responses</th>
<th>Total number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very hard</td>
<td>22</td>
<td>10.0</td>
</tr>
<tr>
<td>hard</td>
<td>105</td>
<td>47.7</td>
</tr>
<tr>
<td>Easy</td>
<td>75</td>
<td>34.1</td>
</tr>
<tr>
<td>Very easy</td>
<td>6</td>
<td>2.7</td>
</tr>
<tr>
<td>Can not tell</td>
<td>12</td>
<td>5.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>220</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Mean 2.514 and Standard Deviation 1.153 Table 23 gives 57.7% of total student in the sample found mathematics hard. When asked in which form did you start feeling that mathematics is very difficult.

**TABLE 24**

In which form did you find mathematics very difficult

<table>
<thead>
<tr>
<th>Form</th>
<th>Total Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>One</td>
<td>19</td>
<td>8.6</td>
</tr>
<tr>
<td>two</td>
<td>33</td>
<td>15.0</td>
</tr>
<tr>
<td>three</td>
<td>136</td>
<td>61.9</td>
</tr>
<tr>
<td>four</td>
<td>32</td>
<td>14.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>220</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>
By the end of form three already 85.5% have found mathematics very difficult and by form four 100% of prospective Primary School teachers found mathematics very difficult. This would imply that by form four they had a negative attitude towards mathematics. The results from tables 7, 17 and 18 highly supports this poor performance.

Thus the null Hypothesis

\[ H_{04} \text{ Attitudes towards mathematics does not affect the performance in mathematics,} \]

was accepted based on the results above.
CHAPTER FIVE

SUMMARY OF THE FINDINGS, CONCLUSIONS, IMPLICATIONS AND RECOMMENDATIONS

5.0 INTRODUCTION

This study was conducted in three Teacher Training Colleges in Nairobi and Kiambu Districts. The purpose of the study was to find out factors that affect the Prospective Primary School teachers achievement in mathematics.

Therefore the aim of the researcher in this Chapter is to give a summary of the findings, the conclusions of the Study, Implications and Recommendations for further study.

5.1 SUMMARY OF THE FINDINGS:

The purpose of this study was concerned with findings out reasons of poor performance in mathematics at all levels of learning in Kenya. The researcher in particular was concerned with the factors that affect the achievement of prospective primary school teachers in mathematics.

The 220 students who participated in the study were randomly selected from a population of 2520 students who were studying in the three colleges.
These students were subjected to giving responses from the questionnaires, did the achievement and methodology tests. From the responses given the researcher came up with the following findings:

1. The results of C.P.E. and K.C.P.E. were just average, with the mean grade of C. This is rather poor at C.P.E. level because most schools require grade A or B for form one admission. Table 6.

2. Performance at O-level (K.C.E.) is poor, over 66% got Pass 7, 8 or failed the paper with grade 9, 32.3% actually failed in mathematics. Most of students blamed the teachers as the responsible for poor performance in mathematics, table 7.

3. Most of the prospective teachers came from poor families. Only 12.7% had one or both the parents employed the rest are either farmers, peasants or are not engaged in any gainful employment. This is true considering those 76.9% who said that their parents paid their school fees; table 14 and 15.

4. Most of Prospective Primary School teachers came from low cost schools and hence poor mathematics back ground as it was stated in Chapter One Table 2.
5. There is a significant difference in performance between male and female prospective teachers.

6. There is a remarkable positive change of attitude among prospective teachers as compared to their negative attitudes during Secondary Education.

7. The interview with the tutors revealed that most of their students are very poor at mathematics and something should be done to improve their standards. They also said that the two years period is not enough to train effective mathematics teachers given that they did poorly at the subject during their Secondary Education.

The tutors blamed the prospective teachers of having negative attitude towards mathematics and they believe that this is the major course of poor performance.

8. The tutors were not trained to teach in T.T.C. but were trained as secondary school teachers or teachers of diploma colleges. So when posted to Primary teacher colleges they have to learn now to teach methodology section from old members of staff or read from books. This left a lot to be desired on the part of the trainees.
5.2. CONCLUSIONS

The conclusions to be found in this section were derived from the data analysed in Chapter 4 and summarised in relevant tables of that Chapter. Since the study was designed to answer four main basic questions on factors affecting Prospecting Primary School teachers namely: Previous Performance in Mathematics, sex difference in performance, student background including schools previously attended and Attitudes towards mathematics. The conclusions will be divided into these four categories.

5.2.1. Conclusions based on Previous Performance in Mathematics.

The null-hypothesis that previous performance in mathematics at the C.P.E. and K.C.E. level does not affect the performance of prospective teachers in mathematics at T.T.C. was rejected at \( P < 0.01 \), level of significance. Tables 6,7 and 8.

5.2.2 Conclusions based on sex difference in Performance.

The null-hypothesis that there is no difference in achievement in mathematics at T.T.C. between male and female prospective teachers was rejected at \( P < 0.05 \) and \( P < 0.01 \).
for the following tests:

(a) Mathematics achievement test - rejected at $P \leq 0.05$ and $P \leq 0.01$.

(b) Methodology test - rejected at $P \leq 0.01$.

(c) O-level mathematics grade - rejected at $P \leq 0.01$.

But was accepted on: -

(d) Continuous Assessment marks for 2nd years only.

(e) Teaching Practice marks also for 2nd Years only.

5.2.3 Conclusions based on students background and previous schools attended table 14 - 20.

The null-hypothesis that student teachers background including schools previously attended have no effect on (his/her) achievement in mathematics at the teachers Training College was generally rejected at $P \leq 0.05$ and $P \leq 0.01$.

From the information given in tables 14 - 20, indicates clearly that the Socio-economic status, type of schools attended and previous performance in mathematics affects the achievement of Prospective Primary School teachers.
5.2.4 Conclusions based on students attitudes towards mathematics:

Tables 21, 22, 23 and 24.

The null Hypothesis that Attitude towards mathematics does not affect the performance in mathematics was accepted on the basis of positive attitudes as given by the score on attitude scale table 21 and 22, and poor performance in all areas of mathematics except continuous assessment and teaching practice results.

The other reason could be that now the students have taken a stand to be teachers of Primary Schools and Mathematics is compulsory both in College and in Primary Schools, the prospective teachers have no choice but to develop a positive attitude towards mathematics.

5.3 GENERAL CONCLUSIONS

This study is one of its own kind in this country and therefore there is very little literature to be reviewed. The ones that are available focus their attention on general teacher education that include all the subjects. Mathematics being the most used subject in life should be given priority in Education.
Tutors should be given proper training before they are posted to T.T.C.

Finally about 60% of the candidates we train in T.T.C. have very poor background in mathematics and can not be effective mathematics teachers.

5.4. IMPLICATION OF THE STUDY

The findings of this study should be noted for their implications to the factors that affect the prospective teachers achievement in mathematics at teachers training colleges. It has been noted that previous performance in mathematics at the C.P.E. and K.C.E. are the major causes of poor performance at T.T.C. The majority of prospective teachers performed poorly in mathematics at C.P.E. and K.C.E. and therefore should not be trained as mathematics teachers for Primary Schools.

The researcher hopes that this study will enable all the responsible parties, particularly the Ministry of Education Science and Technology, to plan effective strategies to overcome the problem of recruiting failures in mathematics to be trained as mathematics teachers in Primary Schools. The tutors recommended at least Credit 6 at K.C.E. mathematics results to be trained as mathematics teachers.
The researcher found out that the tutors do not use remedial classes for weak students, this is a very important point that the concerned authority should make sure it is done to improve mathematics performance in our country.

The findings showed that female students perform poorly as compared to their counterparts - male students. Then it should be helpful that the females who perform poorly in mathematics are not trained as mathematics teachers in Primary Schools.

Finally it is hoped that the Ministry of Education, Science and Technology should discourage the idea of categorising schools like High cost, Middle and Low cost schools so that students do not see themselves in that context. This might improve the performance in most secondary schools where the Governments posts trained graduates. This can also be done through the Inspectorate of Education and Teachers Advisory Centres (T.A.C.).

It is time the government should start implementing specialisation in a criteria that only those who have passed in certain subjects are trained to teach it. Particularly English and Mathematics, and the least grade for such subjects to be Credit Six or better in K.C.E.
5.4 RECOMMENDATIONS FOR FURTHER RESEARCH

The researcher feels that mathematics is a vital subject in the daily lives of everyone in this country, many have aired their views about poor performance in mathematics as compared to other disciplines. It is with this in mind that he feels more research should be done in mathematics:

The following areas should be considered for further study.

1. Due to shortage of time more research should be done on topics related to this one so that the results should have a wider generalisations. The researcher only collected data from three colleges which might not be a good representative to all the 15 colleges offering Pl courses in the whole country.

2. There should be research study to find out the correct duration for training Prospective teachers at the T.T.C. Many tutors were of the opinion that two years is not enough particularly for key subjects like mathematics, science and English.
3. The study should be replicated in a situation in which the researcher involved include Socio-economic status, category of schools they attended and attitude towards mathematics achievement, and methodology to see how they relate to the effectiveness of these teachers in Primary Schools.

4. More research should be conducted, preferably covering Teacher Training Colleges in the country on how Tutors award marks for continuous assessment and Teaching Practice. The marks the researcher found left a lot to be desired.

5. The researcher recommends that research be done to find out how methodology part is taught to prospective teachers and the qualification of the tutors who teach teaching methods in mathematics.
FOOTNOTES


STUDENT QUESTIONNAIRE

APPENDIX A.

SECTION A.

Do not write anything in the boxes numbered 1 - 107.

1. Name of the College where you are studying .

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

2. Your name and admission No.

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

3. Your sex

1. male

2. female

4. Year of study

1. 1st year

2. 2nd year

5. Highest Academic Qualification obtained

1. C.P.E.

2. K.J.S.E.

3. EACE/KCE

4. EAACE/KACE

6. What division did you obtain at KCE/EACE

1. Division one

2. Division Two
3. Division three
4. Division four
5. Failure

7. What grade did you get in mathematics (points):
   1. 1-2 Distinction
   2. 3-6 Credit
   3. 7-8 Pass
   4. 9 Fail

8. If you did KACE/EAACEE tick the subjects you did.
   1. Mathematics
   2. Geography
   3. Economics
   4. Biology
   5. Physics
   6. Chemistry
   7. Others

9. Have you worked as a teacher before?
   1. Yes
   2. No

10. For how long (for those who have taught)
    1. 0-1 years
    2. 2-3 "
    3. 4-5 "
    4. 6 and over
11. Which classes did you teach mathematics

1. Std 1-3
2. " 4-6
3. " 7-8
4. Adult Education

12. List the subjects you mostly like and have confidence in teaching. Check according to your feeling tick the number which is applicable to you.

<table>
<thead>
<tr>
<th>Mostly like</th>
<th>Most like</th>
<th>Like</th>
<th>Dislike</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>History</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Geography</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Home/Science</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Mathematics</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Religious</td>
<td>Study</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Art and Craft</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Music</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>P.E.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Swahili</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Other Subjects</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>
13. During your secondary Education tick your feeling how you found mathematics to be

1. Very hard
2. Hard
3. Easy
4. Very easy
5. I can not tell

14. In which form did you start feeling that mathematics is very difficult.

1. Form One
2. Form Two
3. Form Three
4. Form Four

15. Whom do you think we should blame for poor performance in mathematics in our schools.

1. Children themselves
2. Parents
3. Teachers
4. Educational system in our country
5. Headmasters

16. You are now being trained as a primary school teacher, and you are given chance to study only six subjects. Then indicate your feelings to the right of only six subjects you have decided to take. Tick only one of these given choices per subject
very satisfied  satisfied  dissatisfied

1. Agriculture  1  2  3  34
2. Music  1  2  3  35
3. Art and Craft  1  2  3  36
4. Kiswahili  1  2  3  37
5. Home Science  1  2  3  38
6. Social studies  1  2  3  39
7. English  1  2  3  40
8. Physical Education (P.E)  1  2  3  41
9. Mathematics  1  2  3  42
10. Business Education  1  2  3  43
11. Others

17. what problems do you experience in learning mathematics? Describe briefly

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

18. suggest 2 ways in which mathematics can best be taught in our schools/Colleges so that students/pupils could be able to understand it better.....

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

19. List the text books you are using for mathematics.

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

20. what is the name of the secondary school you attended

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

21. This school named above is

........................................................................................................................................
1. High cost school
2. Low cost school
3. Government aided school
4. Private school
5. Harambee secondary school
6. I did KCE/EACE privately

22. In the school named above ...... (tick only one of these choices)
1. mathematics was my best subject
2. mathematics was my second best subject
3. mathematics was my 6th best subject
4. mathematics was my worst subject
5. I did mathematics because it is compulsory subject.
6. I never attended the class for mathematics but I had to sit the paper

23. During my secondary Education ....
1. Both my parents were employed
2. Both were farmers/peasants
3. Only one was employed the other farmer/peasant
4. My brothers/sisters were employed

24. Who paid your school fees
1. my father/mother
2. my brothers/sisters
3. my uncle/Relatives
25. During my secondary Education I was sent home for fees in my four/six years study.
   - Only once
   - Twice
   - Three times
   - Four times
   - More than five times
   - I was never sent home for fees

26. During my secondary education I was always having
   - Enough pocket money
   - Very little pocket money
   - I had no pocket money at all
   - I had only money for transport nothing else
   - Not one of these

27. What grade did you get in Mathematics at KAPE/KPE/CPE/KPCE.
   - A
   - B
   - C
   - D
   - E
   - F
   I got .............
APPENDIX (A)  
SECTION B  
STUDENT QUESTIONNAIRE

This is just to find out how you feel about mathematics. You are to read each statement carefully and decide how you feel about it. Then indicate your feelings to the right of the questions by checking:

1. SA -(strongly agree)
2. A. -(agree)
3. N -(neutral)
4. D -(disagree)
5. SD -(strongly disagree)

| 1. mathematics often makes me feel angry | 2 | 3 | 4 | 5 |
| SA | A | N | D | SD |

| 2. I usually feel happy when doing mathematics problems |
| 3. I think my mind works well when doing mathematics problems. |
| 4. When I can't figure out a problem I feel as though I am lost in a mass of words and numbers and can't find my way out. |
5. I avoid mathematics because I am not very good with numbers.

6. Mathematics is an interesting subject.

7. I feel sure of myself when doing mathematics.

8. My mind goes blank and I am unable to think clearly when working mathematics problems.

9. I feel sure of myself when doing mathematics compared to other subjects.

10. I sometimes feel like running away from my mathematics problems.

11. I am afraid of mathematics.

12. Mathematics is fun.

13. I like anything with numbers in it.

14. Mathematics problems often scare me.

15. I usually feel calm when doing mathematics problems.

16. I feel good towards mathematics.

17. Mathematics tests always seem difficult.

18. I think about math problems outside of class. I like to work them out.

19. Trying to work mathematics problems makes me nervous.
<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>I have always liked mathematics</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>I would rather do anything else than do mathematics</td>
<td>SA</td>
<td>A</td>
<td>N</td>
<td>D</td>
</tr>
<tr>
<td>22</td>
<td>Mathematics is easy for me.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>I dread mathematics</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>I feel especially capable when doing mathematics problems</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Mathematics class makes me look for ways of using mathematics to solve problems.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Time drags in a mathematics lesson.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>When I hear the word mathematics, I have a feeling of dislike.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Mathematics and me will never agree no matter how well teachers try to explain.</td>
<td></td>
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</table>
ACHIEVEMENT TEST IN MATHEMATICS.

This is just to give rough estimate of your achievement in mathematics can be rated.

SECTION A

Put a circle around the correct teller indicating your best choice of the correct answer you have got. Rough papers are provided.

1. Add 12-9-13+45

<table>
<thead>
<tr>
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<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
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<tr>
<td>35</td>
<td>61</td>
<td>29</td>
<td>79</td>
<td>none of these</td>
<td></td>
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</table>

2. Subtract -15 from -8

<table>
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<th>D</th>
<th>E</th>
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</thead>
<tbody>
<tr>
<td>-7</td>
<td>23</td>
<td>-23</td>
<td>7</td>
<td>none of these</td>
<td></td>
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</tbody>
</table>

3. Compute 5-(-2)4

<table>
<thead>
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<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>-3</td>
<td>13</td>
<td>12</td>
<td>28</td>
<td>none of these</td>
<td></td>
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</table>

4. Compute (-3)5-2(-3)

<table>
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<tr>
<th></th>
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<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>-9</td>
<td>-12</td>
<td>27</td>
<td>21</td>
<td>none of these</td>
<td></td>
</tr>
</tbody>
</table>

5. Compute $4(-3)+2 \over 7+2(-1)$

<table>
<thead>
<tr>
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<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>-2</td>
<td>10</td>
<td>12</td>
<td>none of these</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>9</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6. Multiply 45 thousand times 4 thousands
   \[ 18 \times 10^7 \quad 18 \times 10^6 \quad 18 \times 10^5 \quad 18 \times 10^3 \quad \text{none of these} \]

7. Divide 94091 by 37
   \[ 2.543 \quad 25.43 \quad 2543 \quad 254.3 \quad \text{none of these} \]

8. Reduce \( \frac{240}{264} \)
   \[ 5 \quad 10 \quad 0 \quad 10 \quad \frac{11}{13} \quad \text{none of these} \]

9. Determine the missing denominator \( \frac{27}{36} \)
   \[ 4 \quad 12 \quad 9 \quad 360 \quad \text{none of these} \]

10. Add and reduce \( \frac{3}{4} \) and \( \frac{5}{12} \)
    \[ \frac{1}{6} \quad 7 \quad 6 \quad \frac{5}{12} \quad \text{none of these} \]

11. Compute \( 6 - \frac{23}{4} \)
    \[ \frac{43}{4} \quad 33 \quad 41 \quad 31 \quad \frac{4}{4} \quad \text{none of these} \]

12. Divide and simplify \( \frac{12}{5} \)
    \[ \frac{12}{65} \quad \frac{36}{3} \quad \frac{4}{4} \quad \frac{3}{4} \quad \text{none of these} \]
13. Compute $4+4$

\[ \begin{array}{cccc}
  A & B & C & D \\
  -8 & 16 & 3 & 3 \\
  3 & 3 & 3 & 8 \\
\end{array} \]

14. Which of the following is equal to $\frac{-15}{-7}$

\[ \begin{array}{cccc}
  A & B & C & D \\
  -5 & -5 & -5 & -5 \\
  \frac{7}{7} & \frac{7}{7} & \frac{1}{1} & \frac{7}{7} \\
\end{array} \]

15. 12% of 250

\[ \begin{array}{cccc}
  A & B & C & D \\
  3 & 30 & 0.03 & \frac{125}{6} \\
\end{array} \]

16. 40 is what percent of 150

\[ \begin{array}{cccc}
  A & B & C & D \\
  0.2667\% & 26.67\% & 60\% & 6\% \\
\end{array} \]

17. Express 0.005 as a percent

\[ \begin{array}{cccc}
  A & B & C & D \\
  0.5\% & 5\% & 50\% & 0.05\% \\
\end{array} \]

18. 12 is 75% of what Number

\[ \begin{array}{cccc}
  A & B & C & D \\
  1.67 & 9 & 0.09 & 16 \\
\end{array} \]

19. An increase from 10 to 12 is what percent increase

\[ \begin{array}{cccc}
  A & B & C & D \\
  5\% & 25\% & 20\% & 16.6\% \\
\end{array} \]

none of these
20. Express 5 as a Decimal

\[ \frac{1}{16} \]

A B C D
31.25 0.3125 3.125 312.5

21. Add 8.3 - 4.85

A B C D
3.18 3.45 4.55 -4.55

22. Multiply 3.25 by 0.05

A B C D
16.25 1.625 0.1625 1625

23. Compute \((3.5)^2\)

A B C D
12.25 1225 1.225 122.5

24. Divide \(\frac{.8}{.16}\)

A B C D
1 2 5 0.05

25. Round 19.995 to the nearest hundredth

A B C D
19.99 19.995 20 19

26. Solve for \(T\): \(5T + 3 = 23\)

A B C D
\(\frac{5}{25}\) 15 23 4

69 none of these
70 none of these
71 none of these
72 none of these
73 none of these
74 none of these
75 none of these
27. Solve for \( x \): \(-7x - 3 = 7 - 9x\)

\[
\begin{array}{ccccc}
\text{A} & \text{B} & \text{C} & \text{D} & \text{E} \\
-1 & -5 & 4 & 5 & \text{none of these}
\end{array}
\]

28. Solve for \( K \) in terms of \( a \) and \( b \): \( 7k - b = a \)

\[
\begin{array}{ccccc}
\text{A} & \text{B} & \text{C} & \text{D} & \text{E} \\
a + b & a - b & b - a & b + a & \text{none of these}
\end{array}
\]

29. Suppose \( R = \frac{4p + 2q - 7}{5} \) if \( p = 10 \) and \( q = 3 \), find \( R \).

\[
\begin{array}{ccccc}
\text{A} & \text{B} & \text{C} & \text{D} & \text{E} \\
21 & 1 & 7 & 14 & \text{none of these}
\end{array}
\]

30. Suppose \( R = \frac{4p + 2q - 7}{5} \) if \( p = 10 \) and \( R = 5 \), find \( Q \).

\[
\begin{array}{ccccc}
\text{A} & \text{B} & \text{C} & \text{D} & \text{E} \\
3 & 2 & -2 & -3 & \text{none of these}
\end{array}
\]

31. The quantity \( \frac{4x - 12}{4} \) equals

\[
\begin{array}{ccccc}
\text{A} & \text{B} & \text{C} & \text{D} & \text{E} \\
x - 12 & 4x - 3 & 4x - 8 & x - 3 & \text{none of these}
\end{array}
\]

32. The quantity \( 9Y^2 + 12Y \) equals to

\[
\begin{array}{ccccc}
\text{A} & \text{B} & \text{C} & \text{D} & \text{E} \\
21Y^2 & 21Y & Y(9Y - 12Y) & 3Y(3Y + 4) & \text{none of these}
\end{array}
\]

33. The quantity \( A^{-5} \cdot A^7 \) equals

\[
\begin{array}{ccccc}
\text{A} & \text{B} & \text{C} & \text{D} & \text{E} \\
A^{-35} & 2A^{-35} & A^2 & A^{-2} & \text{none of these}
\end{array}
\]
34. The quantity \( \frac{x^3}{x^6} \) equals

\[
\begin{array}{ccccc}
A & B & C & D & E \\
1 & 2 & x^9 & x & 1 \\
\end{array}
\]

35. \( 3-4^2-2^3 \) equals

\[
\begin{array}{ccccc}
A & B & C & D & E \\
41 & 40 & 136 & 24 & \text{none of these} \\
\end{array}
\]

36. The quantity \( \frac{54y^8}{18y^4} \) equals

\[
\begin{array}{ccccc}
A & B & C & D & E \\
36y^4 & 3y^4 & 3y^2 & \frac{3}{y^2} & \text{none of these} \\
\end{array}
\]

37. The quantity \( 3(2y^2)^3 \) equals

\[
\begin{array}{ccccc}
A & B & C & D & E \\
24y^6 & 18y^5 & 24y^5 & 18y^6 & 8y^6 \\
\end{array}
\]

38. Express \( \frac{3}{8} \) as a decimal

\[
\begin{array}{ccccc}
A & B & C & D & E \\
37.5 & 3.75 & 0.0375 & 0.00375 & \text{none of these} \\
\end{array}
\]
39. Compute \(0.04\) \[\text{A} \quad \text{B} \quad \text{C} \quad \text{D} \quad \text{E}\]

\[
\begin{array}{ccccc}
0.2 & 0.02 & 0.002 & 0.002 & 2
\end{array}
\]

40. If \(0.35 \times 4.5 = K\), what is the value of \(3.5 \times 45\)

\[
\begin{array}{ccccc}
0.5 & k & k & 10k & \text{none of these}
\end{array}
\]

SECTION B

Answer all the questions in this section. Just give the correct answer in one or 2 lines. Do not try to explain. Write your answer in spaces provided below each number.

41. Evaluate \(0.042 \times 1.2\)

\[
\begin{array}{cc}
0.7 \times 0.04
\end{array}
\]

42. Write down two activities you would involve your class in before they are introduced to writing symbols to represent numbers.

43. A common problem among standard 1 children is the writing of reversal numerals. For example
instead of 3 a child writes $3$ and instead of 5 he writes $2$

(a) Give two possible why children do this

(b) Describe a practical activities you could use to help a child overcome this problem

44. A child is asked what is $4 \div 2$ and gives the answer $2$. What mistake has the child made?

How would you rephrase the question to help the child understand what he is being asked?

45. A child is asked to work out $2 \times 3$. He writes $5 \div 4$ down the answer $3$. What mistake has he made? If he wrote the answer $6$, how should he know that his answer must be wrong?
46. Write down two teaching aids which you would use to help pupils master basic addition facts.

47. A child worked out the subtraction question shown 72
    \[ \begin{array}{c}
    72 \\
    \hline
    -47
    \end{array} \]
    35

    What are two mostly likely reasons why the child got this answer instead of the correct answer 25.

48. A child is asked to multiply 45 \times 37 and gets the answer 450.

    (a) How did the child get this answer?

    (b) How could the child have quickly seen that his answer must be wrong?
# RESEARCH BUDGET

**INITIATOR:** NYANGAYO J.A.O

<table>
<thead>
<tr>
<th>ITEM OF EXPENDITURE</th>
<th>ESTIMATED AMOUNT OF EXPENDITURE</th>
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<tr>
<td>TRANSPORT IN CENTRAL PROVINCE</td>
<td>200</td>
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<td>TO NYANZA PROVINCE</td>
<td>400</td>
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<tr>
<td>TO WESTERN PROVINCE</td>
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<tr>
<td>STATIONARY IN FIELD</td>
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<tr>
<td>TYPING AND PHOTOCOPYING OF OF PROPOSAL AND INSTRUMENTS</td>
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<td>AND BINDING</td>
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<tr>
<td>1. 12-5-86 - 23-5-86</td>
<td>Writing Research Proposal</td>
</tr>
<tr>
<td>2. 24-5-86 - 27-5-86</td>
<td>Typing and proof Reading</td>
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<td>3. 30-5-86 -</td>
<td>Submission of Research Proposal to the course Coordinator</td>
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<tr>
<td>4. 2-6-86 - 6-6-86</td>
<td>Sending letters to Principals of T.T.C. and Heads of Mathematics departments.</td>
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<tr>
<td>5. 7-6-86 - 16-6-86</td>
<td>Revision for final Examinations</td>
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<td>6. 17-6-86 - 20-6-86</td>
<td>Examinations</td>
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<tr>
<td>7. 24-6-86 - 12-7-86</td>
<td>Out in the field collecting data and doing observation</td>
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<tr>
<td>8. 13-7-86 - 23-7-86</td>
<td>Data Analysis by tabulation and frequency distribution</td>
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<tr>
<td>9. 25-7-86 - 10-8-86</td>
<td>Writing the project by Chapters, correction by supervisor and Re-writing</td>
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<tr>
<td>10. 11-8-86 - 20-8-86</td>
<td>Typing, Proof-reading and signing by supervisor</td>
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<td>11. 21-8-86 - 27-8-86</td>
<td>Photocopying and Binding</td>
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<td>12. 29-8-86 -</td>
<td>Submission of Bound Research Project.</td>
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BIBLIOGRAPHY


10. Godia, G. "A Comparative study of the effects on achievement, changes in Attitude towards mathematics and Attrition rate of students enrolled in the freshman remedial Arithmetic course under two different instructional approaches" Ohio University, U.S.A. 1981.


20. Sifuna, D. "School Certificate Achievement"


