A STUDY OF THE RELATIONSHIP BETWEEN TEACHERS' ATTITUDES TOWARD MATHEMATICS AND PUPILS' ACHIEVEMENT IN MATHEMATICS IN KISUMU MUNICIPAL PRIMARY SCHOOLS, KISUMU DISTRICT, KENYA

BY

ONYANGO, JAMES A. MELCIO

A PROJECT REPORT SUBMITTED IN PARTIAL FULFILMENT FOR THE DEGREE OF MASTERS OF EDUCATION (P.T.E.) KENYATTA UNIVERSITY
DECLARATION

This Research Project is my original work and has not been presented for a degree in any other University

ONYANGO JAMES A. MELCIO

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

OTIENO ALEGO

LECTURER

DEPARTMENT OF EDUCATION COMMUNICATIONS AND TECHNOLOGY

KENYATTA UNIVERSITY
DEDICATION

This project is dedicated to my beloved parents, Francis Abuom (RIP) and Xtine Akinyi Abuom without whose efforts in educating me, this work would not have been accomplished.

To my beloved wife Valerie, whose sacrifice, patience, understanding and lots of encouragements, was instrumental to the completion of this work.

To our children Alvin Ochieng, Xtine Akinyi, Frank Diego and Mary-Francese Odeka, who always missed my fatherly presence during the course of my study and when carrying out this research project.

Thanks to all of you and may the Lord bless you to carry on from where I have left.
ACKNOWLEDGEMENTS

I wish to express my sincere gratitude and compliments to all those who helped me in this study.

Foremost among them is my Supervisor Otieno-Alego, who inspite of his heavy schedules, teaching and writing out his PhD. work accorded me time for comments, guidance and suggestions throughout the study.

I am also indebted to the Municipal Education Office Kisumu, especially Mr. Ochieng Booker, the M.E.O., Mr. Onyango and all the Municipal teachers who enabled me to get my questionnaires responded to in time.

Thanks to Kisii Teachers College students who helped in marking the OMAT6.

I am grateful to Mrs. M. Bala and Mrs. S. Matara for sacrificing their time to type the work for me.
TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>TITLE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Title</td>
<td>i</td>
</tr>
<tr>
<td>2. Declaration</td>
<td>ii</td>
</tr>
<tr>
<td>3. Dedication</td>
<td>iii</td>
</tr>
<tr>
<td>4. Acknowledgements</td>
<td>iv</td>
</tr>
<tr>
<td>5. Table of Contents</td>
<td>v</td>
</tr>
<tr>
<td>6. Appendices</td>
<td>vi</td>
</tr>
<tr>
<td>7. Tables</td>
<td>vii</td>
</tr>
<tr>
<td>8. Abstract</td>
<td>viii</td>
</tr>
</tbody>
</table>

CHAPTER I

1:0 Introduction 1
1:1 The Research Problem 4
1:2 Identification of the problem 7
1:3 Statement of the problem 7
1:4 Research Questions 8
1:5 Hypothesis of the study 10
1:6 Important variables of study 11
1:7 Assumptions of study 12
1:8 Significance of study 13
1:9 Limitations of the study 15
1:10 Implications of the study 16

CHAPTER II

2:0 Literature Review: 18
2:01 Introduction 18
2:1 Concept Formation and Attitude learning 18
2:2 Literature Review on Achievement 23
### CHAPTER III

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3:0 Design and Methodology of Study</td>
<td>36</td>
</tr>
<tr>
<td>3:1 Introduction</td>
<td>36</td>
</tr>
<tr>
<td>3:2 Research Sample and Selection</td>
<td>37</td>
</tr>
<tr>
<td>3:3 Description of the sample</td>
<td>40</td>
</tr>
<tr>
<td>3:4 Variables Selected for study</td>
<td>41</td>
</tr>
<tr>
<td>3:5 Research Instruments</td>
<td>42</td>
</tr>
<tr>
<td>3:6 Methods and Procedures of collecting Data</td>
<td>44</td>
</tr>
<tr>
<td>3:7 Tests Administration</td>
<td>44</td>
</tr>
<tr>
<td>3:8 Attitude Test</td>
<td>45</td>
</tr>
<tr>
<td>3:9 Mathematical Achievement Test</td>
<td>46</td>
</tr>
</tbody>
</table>

### CHAPTER IV

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>4:0 Data Analysis</td>
<td>47</td>
</tr>
<tr>
<td>4:1 Summaries of the Findings</td>
<td>48</td>
</tr>
<tr>
<td>4:2 The Hypotheses of study</td>
<td>50</td>
</tr>
<tr>
<td>4:3 Interpretations of the sub-hypotheses</td>
<td>52</td>
</tr>
<tr>
<td>4:4 Conclusion</td>
<td>62</td>
</tr>
<tr>
<td>4:5 Recommendations of the study</td>
<td>62</td>
</tr>
<tr>
<td>4:6 Recommendations for further Research</td>
<td>63</td>
</tr>
</tbody>
</table>

5. **BIBLIOGRAPHY**

6. **Instruments and Appendices**

### APPENDICES

<table>
<thead>
<tr>
<th>Appendix I</th>
<th>OMAT 6</th>
<th>72</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appendix II</td>
<td>Answers to OMAT 6</td>
<td>79</td>
</tr>
<tr>
<td>Appendix III</td>
<td>MASJ T</td>
<td>81</td>
</tr>
<tr>
<td>Appendix IV</td>
<td>T - test formula</td>
<td>84</td>
</tr>
<tr>
<td>Appendix V</td>
<td>Teachers years of experience and mean attitude score per category</td>
<td>85</td>
</tr>
<tr>
<td>Appendix VI</td>
<td>Sex of teacher and score in attitude test</td>
<td>86</td>
</tr>
<tr>
<td>Appendix VII</td>
<td>Teachers Grade and mean attitude score</td>
<td>87</td>
</tr>
<tr>
<td>Appendix VIII</td>
<td>Curriculum vitae</td>
<td>88</td>
</tr>
<tr>
<td>Appendix IX</td>
<td>Work plan</td>
<td>89</td>
</tr>
<tr>
<td>Appendix X</td>
<td>Letter TO M.E.O</td>
<td>90</td>
</tr>
<tr>
<td>Appendix XI</td>
<td>Time table</td>
<td>91</td>
</tr>
<tr>
<td>Table I: Teachers' Experience and Attitudes towards Maths</td>
<td>Page 48</td>
<td></td>
</tr>
<tr>
<td>--------------------------------------------------------</td>
<td>--------</td>
<td></td>
</tr>
<tr>
<td>Table II: Teachers' sex and Attitudes towards Mathematics</td>
<td>Page 48</td>
<td></td>
</tr>
<tr>
<td>Table III: Teachers' grade and Attitudes towards Mathematics</td>
<td>Page 49</td>
<td></td>
</tr>
<tr>
<td>Table IV: Pupils' sex and Achievement in Mathematics</td>
<td>Page 49</td>
<td></td>
</tr>
<tr>
<td>Table V: Teachers' Attitudes towards Mathematics by category and Pupils' mean Achievement in Mathematics per school</td>
<td>Page 50</td>
<td></td>
</tr>
</tbody>
</table>
The objective of this study was to investigate the relationship between attitudes toward mathematics by teachers and their pupils' achievement in mathematics - in Kisumu Municipal Primary Schools, Kisumu District - Kenya.

The study also aimed at finding out the following:

(i) The relationship between teachers' experience and teachers' attitudes toward mathematics.

(ii) The relationship between teachers' sex and teachers' attitudes toward mathematics.

(iii) The relationship between teachers' grade and teachers' attitudes toward mathematics.

(iv) The relationship between pupils' sex and pupils' achievement in mathematics.

The sample used consisted of 18 Municipal Primary schools, standard six pupils and their mathematics teachers were treated to questionnaires. The teachers were treated to MASJT questionnaire which sought the teachers' opinions about mathematics. MASJT is a Mathematics Attitude Test for Teachers using the Likert five point scale.
Pupils were treated to a teacher made achievement test of twenty multiple choice items, on form OMAT 6, which is a Mathematics Achievement test for Standard Six.

20 Teachers responded to the MASJT questionnaire, which enabled the researcher to categorise them into two groups thus:
A = Teachers with negative attitudes toward Mathematics, and
B = Teachers with positive attitudes toward mathematics.

Pupil respondents number 341 composed of 179 boys and 172 girls.
The pupils were grouped according to their teachers' category thus
Group A = Pupils taught by teachers with negative attitudes toward mathematics and
Group B = Pupils taught by teachers with positive attitudes toward mathematics.

The main findings of the study were:

1. It was found that, there was a significant difference between teachers attitudes toward mathematics and their pupils achievement in mathematics.

Pupils taught by teachers with negative attitudes toward mathematics (GP.A) are poor achievers in mathematics than those taught by teachers with positive attitudes toward mathematics (GP.B)

So group B pupils are better achievers than Group A pupils.

2. There was a significant difference between teachers years of experience and teachers attitudes toward mathematics.

The "New" teachers (0 - 3 yrs experience) had negative attitudes toward mathematics while "Medium" teachers (3-8 yrs) had the most favourable attitudes toward mathematics on the average.
The "old" teachers (over 8 years experience) had less favourable attitudes toward mathematics than the medium teachers.

3. There was a significant difference between teachers sex and teachers attitudes

The male teachers had more favourable attitudes toward mathematics than the female teachers.
4. There was no significant difference between teachers grades and their attitudes toward mathematics.

5. There was a significant difference between pupils sex and pupils achievement in mathematics. Boys achieved higher on the average than the girls.

It is suggested therefore that teachers positive attitudes toward mathematics should be encouraged by creating favourable atmospheres for trainee teachers in mathematics by the tutors. In order to rectify sex differences in mathematics, it is suggested that teachers should motivate girls so as to assist them to perform equally with boys and the tutors to ensure that female teacher trainees are motivated in mathematics so as to develop positive attitudes toward the subject.

It further suggested that research should be carried out on a wider sample of teachers and pupils country-wide, and to investigate other possible factors such as cultural norms, pupils attitudes toward mathematics and social interactions among teachers and pupils, to compare mathematical achievement between pupils tought by female teachers and those tought by male teachers.

Much as teachers grade has no significant difference in attitudes towards mathematics, this should be investigated to find out significant relationships in attitudes between consequent grades;
1.0 INTRODUCTION

The purpose of this research was to investigate the relationship between Teachers' Attitudes toward Mathematics and Pupils' achievement in mathematics. The study was carried out in Kisumu Town. The sample of the study was derived from Kisumu Municipal Primary Schools. The subjects of the researcher were standard six pupils and their mathematics' teachers from the selected schools.

The pupils were treated to a Mathematics Achievement Test (OMAT 6) while the teachers were treated to an Attitude Test (MASJT).

The investigator was interested in two categories of teachers. Those with positive attitudes toward mathematics as category B and those with negative attitudes toward mathematics as category A. 20 schools were randomly selected from Kisumu Municipal Primary Schools. From each school, one standard six stream was selected as respondents to OMAT6 and their teacher was treated to MASJT, the attitude test for teachers. Not all the pupils per class chosen were respondents. From each class, 20 pupils were randomly selected and treated to OMAT6, the achievement test.

Out of the 20 teachers respondents, 9 were male while 11 were female teachers. Of these, 7 teachers were in category A (negative attitudes toward mathematics) and 13 teachers in category B (positive attitudes toward mathematics).
Out of the 11 female teachers six (6) were in category B and 5 in category A.

For the 9 males, 7 were in category B and 2 in category A.

This study was prompted by the researcher's concern about poor performance in KCPE examinations, in mathematics in particular in our Kenya Primary Schools.

Studies have been carried out on pupils attitudes toward mathematics and their consequent performance in mathematics, and also on sex differences and performance in mathematics. These have been justified to the extent that our attitudes toward a curriculum subject is reflected in our performance in the subject. It is also generally known from some researchers that girls perform poorer in mathematics than boys.

Kisumu Municipality is in Nyanza Province which was ranked fourth by the Examination Council in its performance in KCPE 1986 - Mathematics, out of the eight provinces in Kenya; Nyanza's mean score per pupil in KCPE mathematics 1986 was 49.44 while the mean score for Kisumu Municipality was 54.20. This shows that Kisumu Municipality performed much better; while other Nyanza Schools performed poorly thus lowering the Nyanza average score in mathematics.

The public has often blamed teachers for the poor performances in mathematics. We are also aware of the saying that, "where there is smoke, there is fire".

It is to this that the researcher ascertained the significance of teachers' attitudes toward mathematics and its relationship with
their pupils achievement in mathematics.

Sociologists tell us that schools are socializing agents, where pupils acquire through "crush", their teachers' attitudes and behaviours.

Mathematics is one of the very important curricula subjects in Kenya and is presently being used by many employing agencies in selecting those to be employed. It is therefore important if our children are to join gainful employment, that we investigate some factors that have led to the poor performance at national examinations in this very important subject.

The researcher has reviewed relevant literature on recent researches on Attitudes and Achievements of pupils in mathematics in Chapter II.

Parents' concern on their children's achievement is reflected in the extent to which they go in search for schools, and the amount of money they are willing to spend on books and private tuition, and the exhorbitant fees paid in private schools for their children.

The challenge before science and mathematics teachers in Kenya is to create an appropriate environment in the face of harsh conditions existing in our schools and to develop positive attitudes toward the subjects in their pupils. The teachers must know that children expect a lot from them and always act as watchdogs, observing all that the teachers do. The teacher is the pupil's model and pupils copy them to near perfection. It is from this copying that pupils acquire teachers' attitudes and this could be in the subject like
mathematics; thus developing positive or negative attitudes toward the subject which is reflected in the pupils' achievement.

The national mean mark in 1986 KCPE mathematics was 48.93% against 50.44% in 1985. This reflects a slight drop in performance in 1986. If this is the trend, then there is need to study some possible contributory factors that may be the cause of this decline in mathematics' performance by the pupils.

The researcher studied teachers' attitudes toward mathematics as one of the factors that has made mathematics unpopular amongst the pupils.

1 KCPE Newsletter, 1987, KNEC p. 47

1.1 The Research Problem

Kenya is becoming a technologically oriented country. To manipulate it and live within its present society successfully, there is need for our generation to realise success in the technically oriented subjects like mathematics and science. Parents are making great sacrifices in the hope that their children may live such successful lives.

Schools are being seen more and more as reservoirs of scientific and technological knowledge. It is the task of schools, especially Primary Schools to provide basic foundations for understanding that part of science and mathematics and to develop positive attitudes toward mathematics at the infancy stage for future better achievements in mathematics. Psychologists have confirmed to us the relationship between Achievement, Motivation and Attitude. If a child has a positive attitude toward a teacher he/she gets motivated intrinsically
to subsume what the teacher is teaching him/her; and ultimately achieve higher in that teachers' subject.

So too, if a child has positive attitudes toward mathematics and his/her mathematics teacher also has a positive attitude toward mathematics, he/she will achieve higher in mathematics.

Negative attitudes mean dislike and therefore poor performance as is reflected by one of the findings of this study. Teachers' attitudes toward mathematics are reflected in their pupils' achievement in mathematics.

From the data we have on mathematics performance of pupils in our National Examinations like KCPE and KCE; it is evident that there is a significant difference in performance in mathematics and other subjects in our schools. Mathematics is seen to be more poorly performed by the pupils in these examinations than other subjects. This means that there is a tendency of pupils to fear mathematics, and teachers too have a fear for mathematics. This is what the researcher refers to in this study as "MATHEMAPHOBIA". This general fear for mathematics emanates from the teachers' attitudes toward mathematics as this investigation has proved.

The researcher's problem was to establish possible sources of this phobic behaviour toward mathematics. If the teaching method is poor, it will elicit poor pupil performance and the blame on teachers is justified. Teachers must motivate their pupils and create interest in the learners, meaning that the teachers themselves are not competent enough in the subject or have a negative attitude
toward the subject, mathematics. From findings, it is established that, poor achievement in mathematics has a relationship with the class teachers attitudes toward mathematics.

To carry out this study, the researcher designed a method which sought the relationship between teachers' attitudes toward mathematics and their pupils achievement in mathematics.

The teachers were categorized as;

A = Teachers with negative attitudes toward mathematics, and
B = Teachers with positive attitudes toward mathematics.

Their pupils were treated to a mathematics achievement test -OMAT6- and the results analysed, to establish the relationship between the teachers' attitudes toward mathematics and his/her pupils' achievement in mathematics. The researcher observed a relationship between teachers' attitudes toward mathematics and their pupils performance in mathematics.

1.2 Identification of the Problem

Psychologists have pointed out that children often develop a "crush" in their teachers, that is to say that they have a tendency of copying their teachers as models. This copying ranges from physical characteristics to ideological and personality of the teacher; one of which is the teacher's attitudes. Attitudes can be learned and can be acquired through our cultural backgrounds, norms, taboos, values, ethics and our associates within our society, and within the school's environment. Teachers talk to their pupils in class and outside the class and under social environments, it is under
such conditions that pupils learn their attitudes and interests in various aspects of life and school subjects.

The school as a socializing agent involves a web of interactions between teachers and their pupils. Through this process, attitudes are learned and acquired. It is notable to state here that, if one has a negative attitude toward a subject he will have little or no interest in learning the subject and so will perform poorly in the subject. From these, the researcher established a relationship between teachers' attitudes and pupils' achievement.

1.3 Statement of the Problem

Most educators agree that attitudes play an important part in the learning and teaching processes. Attitudes formed early in life persist throughout life. So, primary school teachers have a heavy responsibility of developing desirable attitudes towards their subject if they are to expect success in the subjects.

In this study, the researcher will try to establish the relationship between Teachers' attitudes towards mathematics and their pupils' achievement in mathematics.

The problem of this investigation can be stated as follows:
"To study the relationship between standard six mathematics teachers' attitudes toward mathematics and their pupils' achievement in mathematics test."

The categories were thus set:-
A = Teachers with negative attitudes toward mathematics
B = Teachers with positive attitudes toward mathematics.
1.4 Research Questions

Time factor as a resource and financial resources being limited during this study, the researcher could not make it possible to investigate all the possible research questions.

However, the following research questions were investigated:

i. Is there any relationship between teachers' attitudes toward mathematics and pupils' achievement in mathematics?

To this question, the study established a relationship between teachers' attitudes toward mathematics and their pupils' achievement in mathematics.

From the study of results of pupils taught by teachers with negative attitudes and those taught by teachers with positive attitudes in the mathematics achievement test averaged per school, using t-test formula on appendix.
ii. Is there any relationship between teachers' years of experience and teachers' attitudes toward mathematics?

Using the same procedures as for Q(i), the findings revealed a significant difference between teachers' years of experience and teachers' attitudes toward mathematics.

Teachers who have been in service for 3-8 years, the medium group elicited more favourable attitudes toward mathematics while teachers who have been in service for over 8 years, the old group also showed positive attitudes toward mathematics but less favourable than the medium group.

New teachers, group (0-3) on the average, scored a negative attitude toward mathematics. Thus, the medium group proved better than the rest followed by the older experienced group. This area needs further research.

iii. Is there any relationship between teachers' attitudes toward mathematics and sex of the teacher?

The investigation revealed that, female teachers had less favourable attitudes toward mathematics than their male counterparts.

iv. Is there any relationship between teachers' attitudes towards mathematics and teachers' grade?

On this question the researcher did not find any significant relationship between teachers' grade and teachers' attitudes.
no teachers' grade has no relationship to teachers' attitude toward mathematics.

All grades of teachers on the average had positive attitudes toward mathematics.

v. Is there any relationship between pupils' sex and pupils achievement in mathematics?

Using the t-test on this item, the researcher established a relationship between pupils sex and pupils achievement in mathematics. Girls on the average achieved less than boys. So boys are better achievers in mathematics than girls at standard six.

1:5 Hypothesis of the Study

The main objective of this study was to verify or nullify the null hypothesis.

The null hypothesis of this study can be stated thus;

\( H_0: \) "There is no significant difference in achievement by pupils taught by teachers with negative attitudes toward mathematics and pupils taught by teachers with positive attitudes toward mathematics"

From this main hypothesis, the following sub-hypotheses were investigated:

\( H_{01}: \) "There is no significant relationship between teachers' years of experience and teachers' attitudes toward mathematics."

\( H_{02}: \) "There is no significant difference between teachers' sex and teachers' attitudes toward mathematics."
H₀³ : There is no significant difference between teachers' grade and teachers' attitudes toward mathematics.

H₀⁴ : "There is no significant difference between pupils sex and pupils achievement in mathematics.

The study verified the main hypothesis and all the sub-hypotheses except sub-hypothesis 3, H₀³ which was nullified.

So for H₀³ : - The findings showed that there is no significant difference between teachers' grade and teachers' attitudes toward mathematics.

1.6 Important variables of Study

A study involving assessment like this is subject to many intervening variables which affect the results. In this study the researcher attempted to control the intervening variables as much as possible by:

(i) Selecting co-educational schools so that boys and girls are treated in the study samples.

(ii) Selecting standard six pupils to control the age factor and standard six is the mid-class of upper primary, with the highest number of mathematics periods per week (7).

(iii) Selected schools are maintained and administered by the Municipal Council of Kisumu to ensure homogeneity in facilities, teachers, administration and other environmental factors.

(iv) Both male and female teachers who taught mathematics in standard six were included in the sample of study.
(v) Teachers' attitudes was the independent variable of study while pupils' achievement was the dependent variable of the study.

(vi) Selected children of upper primary six are more informed in mathematics than those in the lower classes. They have had a longer exposure to mathematics and to teachers of mathematics and have mastered various mathematical concepts.

(vii) Standard six pupils have developed communicative skills and so have less problems in understanding mathematical word problems.

1:7 Assumptions of Study

In this study, the researcher assumed that there exists individual differences in attitudes toward mathematics and achievement in mathematics.

Also that teachers generally fear teaching mathematics because they feel inadequate in it and even those who teach it, have negative attitudes toward teaching mathematics, which is eventually reflected in their pupils' achievement in mathematics.

The researcher also assumed that all the pupils sampled come from and live within Kisumu Municipality, so are all urban influenced and have similar environmental conditions.

It is also assumed that all the schools are manned by competent staff. It is assumed that there was no influence upon the pupils during the administration of OMAT6, and that there was no cheating.
or fear for the test as pupil were assumed to be used to taking such class tests.

Teachers did not influence each others opinions as each worked independently.

1:8 Significance of Study

The two variables, attitudes and achievement in mathematics provided information regarding the relationship between teachers' attitudes toward curriculum subjects on pupils' achievement in the subject.

Mathematics is one of the most important subjects in our Primary Schools and is one of those which is tested on its own at both the KCPE and KCE. It has become a determinant for future career in the Kenyan Employment Industry, as most of the advertisements often ask for those with credits in mathematics at O-level. A positive attitude toward mathematics by teachers will enhance the teachers commitment in his teaching of the subject, thus motivate the children who eventually develop positive attitudes toward mathematics and thus perform better in the subject, thus a brighter future for the children in this competitive generation.

Parental concern about performance in mathematics was observed in 1981 when changing from New Maths to Old Maths - the support the parents accorded this change showed their interest in mathematics in particular and in education of their children in general. Teachers have been victims of the critics. This study affirms the parents accusing fingers in the right direction.
From 1987 KCPE Newsletter, it is evident that there is a decline in mathematics percentage mark from 50.44% in 1985 to 48.93% in 1986.

Pupils' attitudes toward mathematics have also not changed over the years, so are the teachers' attitudes. The subject is often poorly taught and pupils are made to believe that mathematics is too difficult for the average pupil and is meant for only a few smart people.

KCPE mathematics tests skills in mechanical arithmetic, application, problem solving, knowledge; This is what was included in the researcher's set, Achievement test for the pupils - OMAT6.

This test was administered to standard six pupils. The mean score in this test for all the pupils was 43.3 revealing poor mathematical abilities of the pupils. The mean for boys was 45.2 while girls mean score was 39.6, boys achieved averagely better than girls but both means scores were below pass mark of 50%.

Although several researchers have done a lot of studies to compare Attitudes and Achievement in Mathematics, Eshiwani (1980), Kapiyo (1982), Orora (1985) and Ogoma (1986) no much work has been carried out on the relationship between teachers' attitudes and pupils achievement in mathematics.

In this study the researcher's interest was to establish a relationship between pupils' achievement and their teachers' attitudes towards mathematics.
Other researches on this area have been carried out in the Western countries by people like Fennie (1971), Aiken (1974) and little has been done in Kenya.

Many parents, politicians and education administrators in Kenya have often blamed teachers for the poor performances of pupils in the national examinations, especially in mathematics. It is now time to carry out researches seeking to establish the existence of such a relationship, that is, between teachers' attitudes and pupils' achievement in mathematics. Lindsey (1976) put it thus; "Kenya needs highly trained personnel in such scientific and technical areas such as chemistry, engineering and mathematics, which provide the basic foundations of the nations development and progress in the contemporary world."

The researcher contends that the findings will be of significant value and help to establish the facts that attitudes are learned and that pupils learn and develop most of their attitudes toward curriculum subjects from their teachers.

1:9 Limitations of the Study

The amount of time available for the researcher when carrying out this research was rather limited to allow for a wider and larger sample coverage and also to control all the variables that could affect the results.

No attempt was made to investigate parental attitudes, their level of education and their occupations and their subsequent relationships with pupils' achievement.
No attempt was made to investigate teachers' mathematical background especially O-level grades in mathematics, and its relationship to teachers' attitudes towards mathematics.

There was also no other qualitative and quantitative determination of other factors within the school environment which would have been responsible for pupils' achievement. Like facilities and number of teachers and their grades.

Therefore the findings of this study should not be generalized for all other areas in Kenya, but the results will open avenue for further research.

Funds available for this project could not allow the researcher to cover a larger sample.

Kisumu Municipality may not be a cross-sectional representative of all Kenya Primary Schools, urban or rural.

Pre-mature rounding off errors could not be avoided as the researcher employed the use of a simple desk calculator.

1:10 Implications of the Study

The implications of this study was to establish a relationship between teachers' attitudes towards mathematics and pupils' achievement in mathematics.

After sorting out the two teacher categories and categorizing them as A and B, their pupils' mean scores per class was calculated and tabled as shown in Appendix II and summarized in Table IV. The
researcher then tested the null hypothesis by analysing the mean scores of pupils per school taught by teachers with positive attitudes (group B) and those taught by teachers with negative attitudes (group A) towards mathematics.

Early researchers have established that failure in mathematics by pupils during examinations is due to the developed attitudes towards mathematics by pupils and their teachers. It is the researchers' contention to establish here the relationship between teachers' attitudes on pupils' achievement.

Attitudes are learned and also formed. Pupils learn attitudes from their parents, teachers, and peer groups at school.

In urban areas, pupils spend more contact hours with their teachers than with their parents, thus most learned attitudes are learned from the teachers other than from the parents who are generally office ridden, leaving home in the morning for work only to return late in the evening and have no time for the children.
2.0. INTRODUCTION

Most Educators agree that attitudes play an important role in the learning and teaching process. Attitudes formed early in life persist through life. Primary Schools have a heavy responsibility in helping to create favourable attitudes toward subjects. Teachers often find Mathematics difficult and this makes them develop negative attitudes toward Mathematics which they pass on to their pupils.

Many factors exist which affect pupils' achievement in Mathematics. Seemingly one of the factors that has attracted the attention of educators and researchers is the attitudes toward the subject Mathematics by the pupils and pupils' achievement in the subject.

Wain (1978) maintains that, the teacher acts as a mediator between his students and the body of knowledge which is Mathematics. This mediation takes various forms, varying from teacher to teacher, depending on his experience and attitude.

2.1. Concept Formation and Attitude Learning

The child comes to School with prior experiences upon which the teacher draws and further organizes experiences into Mathematical concepts. The child knows what he expects from the teacher, but the teacher also feels he knows what he expects from the child. This conflict occurs to the extent that the teacher wins. So the child sees the teacher as an authority and starts to change his attitude.
as early as possible. He believes in the teacher's authority to the extent that, whatever the teacher believes in and says is what he (the child) has to believe in. This is established through the general methods used in teaching by our Primary School teachers.

The child progresses along a mathematical path guided by his capabilities, his home environment and his formal education. The role of the teacher is to give each child the formal education in mathematics most suitable to his capabilities and environmental interests.

Griffiths (1963) stated that;

"The crucial period in developing attitudes in a child seem to lie in the infant, where his first formal acquaintances with arithmetic is made, thereafter, should proceed at a pace commensurate with his understanding so that he is not baffled on the one hand or bored on the other hand."

Another Researcher Murphy (1962) maintains that;

"Attempts to favourably influence attitudes toward mastery of materials require changing the pupil's perception of himself in relation to that material, ........... unlike interest, attitudes do not respond so readily to mere verbal appeals, the predisposition to expect
failure is often quite resistant to change."²

Here, we see the importance of the teacher as creating a favourable working condition instead of merely telling the pupils to work hard, but must expend effort to show them how to do it.

Schiminka (1973) is of the view that;

"The commulative effect of teacher enthusiasm, and wise teacher behaviour based on awareness from the child's point of view is of subtle importance to motivation, curiosity, frustration, conflict and desire for approval, will result in a classroom where appropriate human relationships are fostered."³

The classroom atmosphere will provide the necessary environment for maintaining independence, self direction, constructive self concepts and equally important, positive attitudes toward the learning of mathematics. Therefore, teachers must be conscious of the fact that teacher behaviour, pupil frustration and conflict do not promote positive emotional commitment to learning task.

Children sometimes develop a dislike for a subject not because of inability but because of the influence of the teachers, parents and relatives. In support of this statement, Evans (1965) had this to say;

"Most people are likely to acquire most of their attitudes in the homes in which they are brought up."
A large part of the education of children consists of training and conditioning them to take their part in adult society, and parents provide examples which are constantly appearing before the children. Parental attitudes may be taken over by the children and made their own, and this is one way in which their influence may be exerted.\(^4\)

This is applicable to the teacher's influence on his pupils. In the educational system today, children are in more contact with their teachers than with their parents. So today's teacher plays more of the parental role. He has more influence on the child's attitude.

This is even more evident in the Urban Schools where parents are working. They go to work early in the morning and come back late in the evening, tired from the day's work, they hardly interact socially with their children. Thus the teacher is more in contact with the children than the children's parents.

Brissenden (1971) says;

"The teacher needs to establish a relaxed classroom atmosphere so that he has time to think on the job, has time to listen to what pupils are saying and to talk with pupils."\(^5\)

To quote Skemp (1971) who was both a Mathematician and a Psychologist;
"The student has no need to accept anything which is not agreeable to his own intelligence. Ideally, he has a duty not to. And it is by the teacher's intelligence and not prestige, eloquence or tyranny, that the student should be led to agree with him. The teaching and learning of Mathematics should thus be an interaction between intelligences, each respecting that of the other. The student respects the greater knowledge of the teacher, and the teacher expects his own understanding to be enlarged."6

Findings indicate that students attitudes toward Mathematics is positive in the early years of primary schooling, but a decline appears as they progress. (J.G. Okech 1980). This definitely indicated some relevance to the assumption that teachers influence pupils attitudes towards mathematics.

Aiken (1972) revealed that teachers' attitudes and effectiveness are the determinants of students' attitudes and performance in Mathematics.

Earlier studies by Aiken and Dredger (1961), Torrance and Parent (1966) give us the importance of the teacher on attitude development.

Phillips (1973) proved in his study that, the teachers' attitudes toward arithmetic is significantly related to students' attitudes and achievement.
Aike (1972) examined various studies carried out in 1960s on the relationship between attitudes and achievement in elementary school mathematics. Oketch J.G. (1978) made a comparative analysis of the mathematical knowledge and mathematical attitude between urban and sub-urban elementary school teachers in USA, he found that, there was a statistically non significant difference at 0.05 level of confidence between urban and sub-urban teachers mean attitude and mean competency scores when the test scores were categorized by sex, teaching experience, and highest degree earned. Thus both urban and sub-urban teachers are same in attitude and competency in mathematics.

We note here that teachers have an influence on their pupils' attitudes and achievement in mathematics.

2:2 Literature Review on Achievement

Previous studies in Kenya in the last two decades have shown that school achievement probably bears the greatest direct relationship to occupational achievement (ILO 1972). This direct relationship between school achievement and occupational opportunities has given certification a high level. Today, public examinations like KCPE, KCE and their subsequent grading of children into qualitative categories are forcing parents to spend fortunes in schools and private tuition for their children. One fundamental motive underlying this parental concern is that; good learning environment has a potential influence on achievement as Maritim (1980) put it.

In recent years, the focus of attack on children's failure
has been directed at teachers who constitute the school environment and are seen as being accountable for the success or failure of pupils.

School achievement is a multidimensional concept. Besides being dependent on a child's social status and economic background, place of residence, school facilities, mental ability and personality, it is also dependent on pupil's attitudes, which the teacher may be a contributor to.

Maritim E. (1980) stated that;

"Mathematically, Achievement (A) is a function (f) of the learner (L) and his Environment (E)."  

He used this function: \( A = f(L, E) \).

The learners environment is composed of teachers, who influence the child in many ways, attitudes inclusive.

Most recent Researchers in Kenya that have examined School achievement are equivocal at best. They seem to assume that Schools achievement is manifest independently on psychological variables.

King (1974) and Somerset (1974) were concerned with Pupils' performance but failed to include in their discussion of pupil personality (Maritim (1983)).
The interpretation of factors external to the individual, such as school facilities, place of residence (urban or rural) have been based on assumptions which ignored intrinsic individual differences. A teacher who has a negative attitude toward mathematics is less likely to encourage his pupils to work hard in mathematics and the ultimate outcome is poor performance by the pupils in mathematics and general development of negative attitudes toward mathematics.

2.3. **Literature Review on Attitudes**

Evans (1965) has this to say;

"Attitudes and interests are learned, ......

..... what form they will take is not
determined at birth or earlier but depends
on the environment in which the child grows
up, and the treatment he receives." ⁸

Bell F.H. (1980) states;

"Home, School and a wider society, all have
their part to play in the inculcation of
attitudes and interest." ⁹

Children grow up in homes and later move to schools. These two environments are built to inculcate attitudes in children. Since attitudes can be learned, then the teacher can pass negative attitudes to pupils about mathematics. Attitudes have effects on learning of mathematics. A person with negative attitudes toward mathematics will have no interest in the
subject and subsequently perform poorly in the subject. In this case, if parents have negative attitudes toward mathematics, then their children are likely to take up that attitude.

Later, the child moves from home to school, a different environment. The child meets teachers and other children, the teacher assumes the role of the parent. Children take up attitudes held by their teachers in the process of interaction in their school. Johnson and Rising (1972) put it that;

"Attitudes are fundamental to dynamics of behaviour. They largely determine what students learn. The attitudes not only determine willingness to study mathematics, but also the use of mathematics, .................

................. The development of positive attitudes toward mathematics is of fundamental concern to the mathematics teacher."10

Bell F.H. (1980) again says that;

"What we learn in school and how well we learn it are very closely tied to our attitudes about schools and subjects that are taught in school. Attitudes and subjects are not learned separately but are learned simultaneously through complex interactions."11

These interactions in school involve;

Student         -         Student
Marilyn Snydam of Ohio University studied attitudes held toward mathematics, her findings were stated thus;

"Pupils of elementary grade have positive attitudes toward mathematics."\textsuperscript{12}

She found no significant difference between attitudes toward mathematics of elementary school girls and boys. She did a commendable work on the problem of study. OKech J.G. also made the same findings.

Snydam also stated that, "Limited evidence has been found that teachers' attitudes toward mathematics affect pupils' attitudes toward the subject."\textsuperscript{13}

Munguti (1984) in his study of factors affecting teaching and learning of mathematics, has this to say;

"Teachers attitudes toward mathematics is a factor that may affect the teaching and learning of mathematics .......... If teachers' attitudes -

Aiken; LR. Jr. "Attitudes toward mathematics."

Review of Educational Research
1970, 46, 551 - 596
Bell; F.H. "The Elementary Mathematics methods and content for grades 1 - 8.

"are negative toward mathematics, this in turn will affect his teaching of the subject and is reflected in his pupils' performance." 13

Mungutc "Factors affecting teaching and learning of mathematics in primary schools in Mbooni - Machakos - Kenya 1984." 14

Godia G. (1980) Stated that,

"In order to promote greater positive attitudes toward mathematics, it is essential for instructors to locate the specific skills that students are deficient in and then concentrate on improving these skills." 15

This is possible only when the teacher himself has a positive attitude toward mathematics. Positive attitudes toward a subject plays a positive role in causing the students to learn the subject effectively, and thus achieve better in the subject.

Johnson; D.A., stated that;

"It is the attitudes that our students develop which are likely to stimulate or stop further study of the subject. It is the attitude that we build that highly involve us in the learning and retention in our subject .......... and often, it is the attitudes you build that are the basis of your rank as a successful of unsuccessful teacher." 16
So if a pupil develops a positive attitude then the chances of his liking the subject and at the same time performing well are increased.

Johnson went further to stress that;

"If the attitudes of appreciation of mathematics is attained by the student, then he studies mathematics because he enjoys it, he gets satisfaction from knowing mathematical ideas, he feels rewarded when he attains mathematical competency."\(^{17}\)

Harold Learch expressed that;

"Teachers have a big responsibility in designing instructional materials and strategies that would help promote positive attitudes in the classroom."\(^{18}\)

The importance of developing and maintaining desirable attitudes toward Arithmetic suggests that Teachers at all grade levels should be aware of their pupils' attitudes toward the subject and should strive to use favourable attitudes toward mathematics .........

The classroom organizational procedures and teaching methods should be ones which assure each pupil a measure of success at his own level of ability and understanding which at the same time encourages the development and maintenance of favourable attitudes toward mathematics. It is important to note that whereas Learch felt that learning situations should be a
pleasant one, Robert F. Mager, pointed out that;

"It is not necessary that lessons be fun
and students be required to workhard." ¹⁹

So Johnson, Learch and Mager stressed the relationship between attitudes and achievement in arithmetic; Research studies in this areas have not been conclusive.

This is why the researcher has tried to further establish the correlation.

Robert Fennie highlighted this point when he stated that the matter of attitudes toward mathematics need additional study. It should be helpful to explore various areas and avenues that might lead to changes in attitudes and also to explore the effects of changed attitudes on study habits and achievement in mathematics. Learch also found out that the organizational procedures of grouping or individualizing instruction do not necessarily contribute to the development of more favourable attitudes on the part of pupils.

Lyda and Morse concluded in their study on attitudes and achievement in mathematics that;

"When meaningful methods of teaching arithmetic are used, changes in attitudes toward arithmetic take place. Negative attitudes become positive and the intensity of positive attitudes become enhanced ............ Associated with meaningful methods of teaching, Arithmetic and changes in attitude, are significant gains in Arithmetic and achievement, that
is computation and reasoning"\textsuperscript{20}

Basham et al, however felt that prediction of achievement on the basis of attitude score for individuals is somehow risky.

Jonathan Kraup felt that;

"There is more need for information concerning attitudes and children towards specific activities and procedures used in teaching Arithmetic."\textsuperscript{21}

Methods of teaching and learning that develop positive attitudes as well as promoting learning and lowering attrition rates should be developed by the teachers. There is need for further study to determine the relationship between attitudes, achievement

\begin{quote}
LEARCH; H.H. Arithmetic Instruction changes pupils attitudes towards Arithmetic.

LYDA; W.J. & Attitudes, Teaching methods and Arithmetic
MORSE E.C.: Achievement.

KRAUP; J: Are children's attitudes toward Mathematics Really Important?
- School Science and Mathematics 1973, P. 9 - 15
and attrition rates. Phillips (1973) proved in his study that the teachers attitudes toward mathematics is significantly related to pupils attitudes and achievement in Mathematics. Kapiyo (1982) in his findings stated that;

"The higher the scores in mathematical ability tests, the higher the scores in Mathematical Achievement test."22

he is implying here that, pupils mathematical achievement is influenced by their ability in mathematics. He further established that the pupils attending high cost Schools within Kisumu Municipality, achieved higher in mathematics.

This is why the researcher took non-private schools only, run by the Municipality for homogeneity of the sample.

On performance of pupils in mathematics between boys and girls. Kapiyo found significant correlation between Mathematical Achievement test and English proficiency test (P. 102). He also established that male pupils perform better than female pupils in Mathematical ability test, Achievement test and vocabulary tests.

KAPIYO; R.J.A. "An investigation into the relationship Between Mathematical Achievement and Mathematical ability of Std 7 children."

P. 82 (1982).
Maritim E. (1979) explained such difference in performance between boys and girls to be on academic self-perception; closely linked to attitudes toward Mathematics. Females have negative attitudes toward mathematics so they perform poorly in Mathematics. The attitude held against girls as concerns Mathematics by the teachers are bound to influence the kind of interaction between the female pupils and the mathematics teachers. This association is strengthened by the sex of the Mathematics teacher.

The kind of interaction between male and female pupils might be different from that between a female teacher and a female pupil.

This chapter has reviewed literature related to this study, the next Chapters will look into the design of the study, the methodology, instruments and data analysis.
FOOTNOTES

<table>
<thead>
<tr>
<th>Footnote</th>
<th>Reference</th>
<th>Year</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Griffiths</td>
<td>1963</td>
<td>Attitude Development in Arithmetic&lt;br&gt;Arithmetic teacher Vol. 8, P. 102</td>
</tr>
<tr>
<td>2.</td>
<td>Murphy</td>
<td>1962</td>
<td>Attitude and Achievement in Arithmetic&lt;br&gt;, Vol. 11 - 12 P. 66 - 72</td>
</tr>
<tr>
<td>4.</td>
<td>Evans</td>
<td>1965</td>
<td>Environmental Effects on leaving Arithmetic P. 10</td>
</tr>
<tr>
<td>6.</td>
<td>Skemp</td>
<td>1971</td>
<td>Classroom Atmosphere P. 66</td>
</tr>
<tr>
<td>7.</td>
<td>Maritim, E.</td>
<td>1980</td>
<td>Academic self-concept and the&lt;br&gt;teacher perception; Their&lt;br&gt;relationship to pupils grade Attainment&lt;br&gt;in Rural Kenya.</td>
</tr>
<tr>
<td>9.</td>
<td>Bell, F.H.</td>
<td></td>
<td>The Elementary Mathematics and&lt;br&gt;Content for grades 1 - 8</td>
</tr>
<tr>
<td>12, 13:</td>
<td>Marylyn Snydam</td>
<td>1972</td>
<td>Attitudes of Elementary School pupils&lt;br&gt;toward Mathematics. P.41-52</td>
</tr>
<tr>
<td>14:</td>
<td>Mungut</td>
<td>1984</td>
<td>Factors Affecting learning and Teaching Mathematics&lt;br&gt;P.32</td>
</tr>
<tr>
<td>15:</td>
<td>Godia G.</td>
<td>1980</td>
<td>Mathematical Ability of College Freshmen - P.56</td>
</tr>
<tr>
<td>18:</td>
<td>Learch H.;</td>
<td></td>
<td>Arithmetic Instruction changes&lt;br&gt;pupils attitudes toward Arithmetic. -&lt;br&gt;Arithmetic Teacher P. 119&lt;br&gt;1960 - 61, vol. 7 - 8</td>
</tr>
</tbody>
</table>
20: Lyda and Morse 1962 - 3 - Arithmetic Teacher

"Attitudes, Teaching Methods
and Arithmetic Achievement
P. 138.

21. Kraup J.

- "Are Children's Attitudes
toward Learning Mathematics
really important?
- School Science and Mathematics

22. Kapiyo R.J.A. 1982 - An Investigation into the
Relationship Between Mathematical
Ability and Mathematical
Achievement of STD 7 Children
- Kenya P.82.
CHAPTER III

3:0 DESIGN AND METHODOLOGY OF STUDY

"Is it life, I ask, is it even prudence, to bore thyself and bore the students"

=Jonathan Wolfagang Von Goethe=

3:1 INTRODUCTION

This study was a survey intended to look into teachers' attitudes towards mathematics and its subsequent relationship with pupils' achievement in mathematics in our Primary Schools.

The subject of the study were standard six pupils and their mathematics teachers. The researcher dealt with standard six pupils and their teachers within Kisumu Municipal Primary Schools.

The variables considered in the study were:
1. Teachers' attitudes towards mathematics;
2. Teachers' grade, experience and sex and subsequent attitudes towards mathematics;
3. Pupils' achievement in mathematics;

Many factors affecting pupils' achievement in mathematics exist, but due to time factor, the researcher could not venture into all of them. Most of these other factors have been mentioned in the chapter on literature review; others also which affect achievement of pupils are I.Q levels, the child's background and environmental factors to mention a few others.
In this chapter attempt is made to describe the sample chosen for the study, the methodology and instruments used in gathering the data to test the hypothesis.

The decision to obtain data from Kisumu Municipal Primary Schools was prompted by the researcher's familiarity with the town geography. This was useful because it enabled the data collection process to proceed at speed with maximum response from the respondents; thus saved a lot of useful time.

Administration of the instruments for investigation to the respondents was done during the second term in the month of June 1988. All the schools were covered within two days. In each of the sampled schools, one teacher who taught mathematics in standard six was treated to an attitude test (MASJT) and his pupils were treated to an achievement test in mathematics (OMAT6). 20 pupils were randomly selected from each class to sit this test.

3:2 Research Sample and Its Selection

Kisumu Municipality has a total of 42 primary schools geographically distributed within the town under 5 zones. To cover all the zones, the researcher designed a sampling procedure which included every zone in the sample. As the researcher could not sample all the 42 schools, 20 schools were selected with at least 4 schools from each zone. From each school, 20 pupils were treated to the OMAT6, so a total of 400 pupils were treated to OMAT6, the Achievement test. Twenty (20) teachers from the sampled schools who taught the sampled pupils mathematics (standard six) were treated to an attitude test (MASJT).
From this test, the teachers were categorized into two groups, A and B. Those in group A were teachers with negative attitudes toward mathematics which was elicited from their score in the attitude test. Those who scored below 60 in the attitude test were rated as having negative attitudes toward mathematics and categorized as group A. For group B, the score in the attitude test was over 60, thus depicting those with positive attitudes toward mathematics.

So

\[ A = \text{Teachers with negative attitudes toward mathematics} \]

\[ B = \text{Teachers with positive attitudes toward mathematics} \]

Out of the twenty (20) teacher respondents 13 were categorized under group B and 7 categorized under group A.

The mean scores for their pupils was computed and the mean score for all pupils in group A computed and compared with the mean score for all pupils of group B. These two means \( X_A \) and \( X_B \) were compared to find out whether those pupils taught by group B teachers performed better than those pupils taught by group A teachers. That is to find out \( H_0: \overline{X}_B = \overline{X}_A \) or otherwise.

The mathematical Achievement Test OMAT6 covered most of the work covered in standard five and six of the pupils text book, the Primary Mathematics Books 5 and 6.

The researcher assumed all schools had covered an equal amount of work at the time of taking the test so no school had advantage over the other. This assumption was probably correct as the Municipal Education Officer monitors topic coverages in all his schools to ensure teachers cover topics identically and move at nearly the
same cases; through the use of a common scheme of work for all municipa.
schools.

353 pupils responded to the OMAT6 (The Mathematical Achievement
Teast for standard 6). These were from 18 schools as 2 schools
submitted their pupils questionnaires back too late to be included
in the sample. However, all the teachers' responses were received,
that is 20 teachers responded to the MASJT, (the Mathematical Attitude
Test for Teachers). Out of the 353 pupil respondents, 179 were
boys and 172 were girls. 2 pupils did not indicate their sexes.
For teachers, 9 were males and 11 were females.

The researcher therefore used two questionnaires, one for teachers
which categorized the teachers into Groups A and B. The second
questionnaire was for pupils of standard six. It was a mathematics
Achievement test.

On the mathematical attitude test, the teachers gave information
on their sex, grade and years of experience and school. On the
mathematical achievement test given to the pupils, they also gave
information about their sex and school.

The name of the school was important for categorizing pupils under
their rightful teachers.

Kisumu Municipal Primary Schools are taken to be more homogeneous
in terms of facilities, administration, and environment.
3:3 **Description of the Sample**

The sampled teachers for the investigation were randomly selected on the understanding that they taught standard six pupils mathematics and their pupils did the Achievement test.

The pupils were from standard six classes of the sampled schools. The sample was composed of 20 teachers who taught standard six mathematics. There was one Untrained Teacher; no P3; 3P2s, 15Ps, and one S1. 3 teachers were categorized as ‘New teachers’ (0 - 3 years experience), 6 teachers were categorized as medium term teachers (3-8 years experience) and 11 teachers were categorized as ‘old’ (over 8 years experience).

7 teachers elicited negative attitudes toward mathematics and were grouped as group A while 13 teachers elicited positive attitudes toward mathematics and were categorized as group B.

The attitude test used the Likert scale 5 point method to rate the teachers' attitudes as negative or positive toward mathematics. Those who scored below 60 in the scale were categorized as A and those who scored over 60 were categorized as B.

353 pupil respondents consisted of 179 boys and 172 girls. 2 pupils did not indicate their sexes.

The pupils were then put in their teachers' category as those taught by Group A and those taught by Group B teachers respectively.
The number of standard six classes in Kenya is very large. This means that to get a representative and meaningful sample of study could not have been easy considering the time available. The following conditions were considered when sampling the schools for the study:

1 - Be mixed primary schools run by the Municipal Council of Kisumu.
2 - Must have standard six class
3 - Must have a fifty-fifty ratio of girls and boys.
4 - Only one stream of standard six was sampled per school
5 - All the 5 zones within the Municipality had to have at least 4 representative schools to eliminate zonal bias in the study.
6 - Teachers were advised not to seek others opinions when responding to the questionnaire.
7 - Pupils were put in an examination condition to avoid cheating. The test was timed for the pupils so that there was uniformity on speed.

Variables Selected For Study

The dependent variable for study was pupils' achievement in mathematics which is broadly also affected by differing environmental factors and pupils' ability. The independent variable for the study was Teachers' attitudes toward mathematics; the researcher tried to establish a relationship between pupils' achievement in mathematics and their teachers' attitudes toward mathematics. That is to say, whether teachers' attitudes toward mathematics influenced pupils' achievement in mathematics.

Other variables considered in the study included:
- Teachers' sex, grade and experience, and pupils sex.

Under normal conditions what one achieves is presumed to depend on his ability. Given environmental variables and school as a socializing agent, other factors can be significant in influencing pupils achievement. The researcher's interest was focussed on Teachers' attitudes toward mathematics and its relationship with pupils' achievement in mathematics.

Researches have shown that sex of pupils has a significant relationship with achievement in mathematics.

3.5 Research Instruments

The main instrument of this research is a questionnaire. There were two questionnaires, one for the pupils and one for the teachers. The teacher respondents were treated to a Mathematical Attitude Test composed of 20 items which sought the teachers' opinions about mathematics. This Mathematical Attitude test known as MASJT in Appendix III was given to all standard six mathematics teachers in the sampled schools.

It was designed using the Likert Scale (five point) method. It was then used to categorize the teachers into two categories A and B. Category A = teachers with negative attitudes toward mathematics and category B = teachers with positive attitudes toward mathematics.

The pupils of the sampled teachers from category A and B were treated to a Mathematical Achievement test, known in this study as OMAT6. The test was scored to find the relationship between teachers' attitudes toward mathematics and their pupils' achievement in mathematics.
The mathematics achievement test consisted of 20 items, of multiple choice questions. Each question carried 5 marks so that the score was out of 100. OMAT6 is on Appendix I. The respondents to this achievement test were standard six pupils whose teachers also did the Attitude test.

In the two Questionnaires, the teachers were required to provide demographic information of their grade, sex, and experience and their teaching school's name.

On the pupils questionnaire, they indicated their sex and name of their schools so that grouping them per school under their rightful teachers was easy.

Piloting of these questionnaires were carried out as indicated in Appendix II.

After the tests administration, they were scored. The mean scores were then tabulated and analysed. The t-test was used in all cases to establish the relationships that existed between attitudes and achievement.

The OMAT6 was designed in the KCPE style, covering:

- Arithmetic reasoning
- Problem solving
- Mathematical concepts
- Arithmetic computation
- Mathematical Application and Interpretations.
Methods and Procedures of Collecting Data

The researcher administered the questionnaires to the respondents in their respective schools. The purpose of the questionnaires was explained to the respondents. Class teachers were used as assistants to help administer the OMAT6 to the pupils. The researcher ensured that the respondents' answers were not interfered with in any way. The teacher respondents did their questionnaires in their staff-room while the pupils did their test in their respective classes.

The finished forms were collected and data analysis done after scoring the marks for both pupils and teachers. MASJT scores enabled the researcher to categorize the teachers as A and B groups depending on attitudes.

Tests Administration

A testing programme as shown in Appendix III was sent to the schools through the Municipal Education Officer in advance showing the tests time-table and requirements. Pupils were required to have pencils, rubber and rough papers. They were to circle the letter corresponding to the correct answer to the question on the question papers. They also provided demographic information about their sex and name of the school. It was assumed that the pupils were used to test taking and so were not surprised by this test. Instructions to the pupils were as on Appendix I of OMAT6. For teachers, they gave their opinions about each item on MASJT by ticking the box corresponding to the appropriate adjective
suitable to their opinions about the item. Teachers also gave
demographic information about name of their school, his grade,
experience in years and his sex.

Instructions to the teachers were as shown on Appendix III
of the MASJT.

The teachers took their tests at the same time with the pupils;
but they worked individually in their places of work. Most of them
used the staff-room.

3:8 Attitude Test

The attitude test was administered to the teachers of standard six
mathematics only of the sampled schools on the understanding that
their pupils took the mathematics achievement test - OMAT6.

This test was scored and used to categorize the teachers in two
categories A and B. 7 teachers were categorized A and 13 categorized
B. Pupils were categorized into these groups A and B according
to where their teacher fell.

The mathematical Attitude test measured the teachers' Attitudes
toward mathematics. Thus:
A = Teachers with negative attitudes towards mathematics
B = Teachers with positive attitudes toward mathematics

It has been observed that teachers' attitudes toward a subject
influence the way they teach the subject to their pupils; and hence
an effect on pupils achievement in the subject. The attitude test
for teachers MASJT consisted of 20 items. Likert Scale of 5 point method was used to score the attitudes as SA(5), A(4), N(3), D(2), SD(1) for positive items and vice versa for negative items. The score of over 60 elicited positive attitudes thus group B teachers and below 60 elicited negative attitudes thus group A teachers.

None of the teachers scored 60 thus none elicited a neutral attitude toward mathematics as seen on Appendix vi

3:9 Mathematical Achievement Test

Mathematical Achievement of the pupils was the dependent variable of the study. To assess the level of achievement in mathematics, the mathematical achievement test was administered to the pupil respondents. It is known in this research as OMAT6. It was piloted and pre-tested during implementation to remove ambiguity and check on levels of difficulty. The test was based on Primary Mathematics for standard 5 and 6.

Questions were based on what pupils had covered in standard five and six only; and set in the KCPE style.

Only 20 items were set. They were multiple choice items.

Maximum score was 100 and minimum 0 as each carried 5 marks. On the questionnaire the pupils provided demographic data about their sex and schools name as Appendix I shows.
4:0 DATA ANALYSIS

This chapter contains the findings, the analysis and interpretations of these findings.

After collecting the data from the field, the investigator calculated the means \( \bar{X} \) of the pupils' score in the mathematics achievement test per school, the variance and the standard deviations and used the t-test to test for significance of the hypothesis set for this study.

The students t-test is given by the formula: on the appendix.
The researcher set the confidence interval at 95%; and $X = 0.05$; to find out the relationships in all the hypothesis set in this study.

The following tables are a summary of the findings which are explained further in the findings.

### 4:1 Summary of the Findings

#### Table I

Teachers' Experience and Attitudes toward Mathematics:

<table>
<thead>
<tr>
<th>EXPERIENCE YRS</th>
<th>N 0 - 3</th>
<th>M 3 - 8</th>
<th>0 Over 8</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>3</td>
<td>6</td>
<td>11</td>
<td>20</td>
</tr>
<tr>
<td>$\bar{X}$</td>
<td>56.3</td>
<td>65.2</td>
<td>63.2</td>
<td></td>
</tr>
<tr>
<td>$S^2$</td>
<td>80.34</td>
<td>30.57</td>
<td>53.96</td>
<td></td>
</tr>
<tr>
<td>$S$</td>
<td>8.96</td>
<td>5.53</td>
<td>7.35</td>
<td></td>
</tr>
</tbody>
</table>

#### Table II

Teachers' sex and Attitudes toward mathematics:

<table>
<thead>
<tr>
<th>SEX</th>
<th>M</th>
<th>F</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>9</td>
<td>11</td>
<td>20</td>
</tr>
<tr>
<td>$\bar{X}$</td>
<td>63.1</td>
<td>62.5</td>
<td></td>
</tr>
<tr>
<td>$S^2$</td>
<td>75.88</td>
<td>32.99</td>
<td></td>
</tr>
<tr>
<td>$S$</td>
<td>8.71</td>
<td>5.74</td>
<td></td>
</tr>
</tbody>
</table>
Table III

Teachers' grade and Attitude toward mathematics:

<table>
<thead>
<tr>
<th>GRADE</th>
<th>UT</th>
<th>P2</th>
<th>P1</th>
<th>S1</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>1</td>
<td>3</td>
<td>15</td>
<td>1</td>
<td>20</td>
</tr>
<tr>
<td>\bar{x}</td>
<td>67</td>
<td>69.3</td>
<td>61.3</td>
<td>67</td>
<td></td>
</tr>
<tr>
<td>S^2</td>
<td>0</td>
<td>16.34</td>
<td>51.1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>0</td>
<td>4.04</td>
<td>7.15</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

Table IV

Pupils' sex and Achievement in mathematics per school

<table>
<thead>
<tr>
<th>SEX</th>
<th>BOYS</th>
<th>GIRLS</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>18</td>
<td>18</td>
<td>36</td>
</tr>
<tr>
<td>\bar{x}</td>
<td>43.3</td>
<td>41</td>
<td></td>
</tr>
<tr>
<td>S^2</td>
<td>143.1</td>
<td>146.5</td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>11.96</td>
<td>12.1</td>
<td></td>
</tr>
</tbody>
</table>
From these tables which summarize the findings of the investigation under:

(i) Teachers' experience and attitudes toward mathematics
(ii) Teachers' sex and attitudes toward mathematics
(iii) Teachers grade and attitudes toward mathematics
(iv) Pupils sex and Achievement in mathematics
(v) Teachers' attitudes toward mathematics and pupils' Achievement in mathematics;

Interpretations then followed thus:-

4:2 Ho: THE HYPOTHESES OF STUDY

The main purpose of this study was to find a relationship between teachers' attitudes toward mathematics and pupils' achievement in mathematics.

The hypotheses of study is stated thus:-

Ho: "There is no significant difference between teachers' attitudes toward mathematics and their pupils' achievement in mathematics". While the null-hypotheses states that:-

Ha: "There is a significant difference between teachers' attitudes toward mathematics and pupils' achievement in mathematics".

20 Teachers were treated to an attitude test MASJT; there were 20 items to be responded to as shown in appendix III. Out of the 20 teachers, 7 had a score below 60 showing a negative attitude toward mathematics. The other 13 had positive attitudes toward mathematics, they had scores of over 60.
Their pupils were then grouped under the two groups of A and B
A = teachers with negative attitudes
B = teachers with positive attitudes
The scores are summarized in table 5.

Mean score for category A pupils was 39.6 while those for category B was 45.3. Thus pupils taught by teachers with positive attitudes toward mathematics had a higher score in the achievement test than those taught by teachers with negative attitude. Thus attitude of the teacher toward a subject has an influence on pupils' achievement in the subject.

To prove the significance of the finding; the t-test was used. Calculating t - the result showed that, there is a significant difference between achievement of pupils taught by group A and group B teachers.

Pupils who took the OMAT 6, had their teachers treated to MASJT. The scores in MASJT were analysed to categorize the teachers as those with positive attitudes towards mathematics. The mean scores of their pupils were analysed and summarised as in table 5.

The findings reveal that, pupils taught by teachers with negative attitudes toward mathematics are low achievers in mathematics. Thus teachers' attitude has a significant role in his pupils' achievement in the subject, according to this research. The teachers' attitude is reflected in their pupils' achievement in mathematics. The findings also reveal that there is a significant difference in performance and achievement of pupils taught by teachers with positive and negative attitudes toward mathematics. Pupils taught by teachers with negative attitudes toward mathematics are poor achievers in the subject, while those taught by teachers with positive attitudes toward mathematics are high achievers in mathematics.

So teachers' attitudes toward a subject influence pupils' achievement. This is because if a teacher holds a negative attitude toward a subject, he will ultimately influence his pupils to think and hold such negative opinions about the subject, thus pupils ignore working hard in the subject and finally perform poorly in the subject.

Teachers with positive attitudes toward mathematics have an interest in the subject and so teach the subject with confidence and motivate their pupils to develop a liking for the subject. The ultimate result is that pupils develop interest in the subject and so work hard in that subject as they are motivated to learn by the interest of their teacher. Thus to perform and achieve better in mathematics, teachers should hold positive attitudes toward the subject.
4:3 INTERPRETATIONS OF THE SUB-HYPOTHESES

1. Ho: 1. "There is no significant difference between the teachers' years of experience and teachers' attitudes toward mathematics." Teachers were placed in three categories thus N(0-3 yrs), M(3-8 yrs) and O(over 8 yrs) of experience as teachers.

TABLE 1. Summarizes the sample category distribution.

Using t-test between these categories it was found that:

(i) There is a significant difference in attitude toward mathematics between the new teachers and the medium term teachers, showing that the medium term teachers hold more positive attitudes toward mathematics than the new teachers.

(ii) In comparing the medium term teachers and the old teachers the findings reveal that medium terms hold a more positive attitude toward mathematics than the old service teachers.

(iii) The researcher then tested the significance of attitude difference between the old serving teachers and the new serving teachers. The findings here revealed that the old serving teachers hold a more positive attitude toward mathematics than the new teachers.

It therefore shows that there is a significant change in attitude amongst the three categories of teachers. The new teachers having less positive attitudes toward mathematics while the medium term experienced teachers holding the most positive attitudes toward mathematics. It is worth noting that most of the medium term teachers sampled were P2s.
It is possible then to explain this outcome by finding out how P2 teachers are recruited into training colleges.

Most P2s are KJSE candidates, others sat exams privately and so have not developed the traumatic experience with mathematics as is the case with most Pls who are form four leavers and many have a grade 9 in mathematics at O-levels, thus have developed a hatred for mathematics. I qualify this statement by referring to table 3 which also shows that most Pls sampled are old teachers. So at 95% confidence the findings reject the sub-hypothesis Ho:1 and we can say that, "There is a significant difference between teachers' experience and teachers' attitudes toward mathematics.

ii. This research also investigated the relationship between teachers sex and teachers attitudes toward mathematics.

It is a common talk amongst the common men and the intellectuals alike that females have a general dislike for mathematics. In this research, sex and attitude is one of the variables of study.

The researcher sampled a total of 20 teachers from the Kisumu Municipal Primary schools. All the sampled teachers taught standard six mathematics in their respective schools. It should be obvious therefore that they have a liking for mathematics. Both male and female teachers were sampled and were treated to a MASJT which is a Mathematics Attitude Test for Teachers.

Scores for each teacher was attained after marking the MASJT. The teachers were then categorized as category A and category B.
Category A were teachers who scored less than 60 in the attitude scale and so were referred to as teachers with negative attitudes toward mathematics. Category B teachers were those with positive attitudes toward mathematics, their scores were over 60 in the MASJT using the t-test at C.I. = 95% and degree of freedom 18, the Hypothesis set was rejected.

Out of the 20 teachers, 9 were male and 11 were female. Of the 9 males, 6 were categorized B and 3 categorized A. While out of the 11 females, 6 were categorized B and 5 categorized A. The mean attitude score for the females was 62.5 while for males it was 63.1.

Variance for females was 75.86 while for the males it was 32.99. Table 2 gives the summary of the findings.

This finding shows that,
"There is a significant difference between sex of teachers and teachers attitude toward mathematics."

Female teachers have less favourable attitudes toward mathematics than male teachers. Male teachers hold a more positive attitude toward mathematics than the female teachers.
This finding is in line with other researches earlier by E.K. Maritim (1980) who put it that this difference in attitudes toward mathematics between male and female scholars is due to perception, how one sees and rates him/herself

(iii) Teachers Grade and attitude:

The Ho:3 "There is no significant difference between teachers' grade and teachers' attitudes toward mathematics."

This hypothesis was studied, the 20 teachers were treated to an attitude test - MASJT. There was 1 Untrained teacher whose attitude score was 67 thus depicting a positive attitude toward mathematics, three P2s with mean score in attitude of 69.3, variance 16.34 and standard deviation 4.04.

P1s were 15 with mean attitude score 61.3, variance 51.1 and standard deviation 7.15. They also elicited a positive attitude toward mathematics.

There was only one S1 teacher with a score of 67 in the attitude scale.

So all the teachers as is seen on table 3 had positive attitudes towards mathematics.

As there was only one Untrained teacher and 1 S1 who both showed positive attitudes toward mathematics, the researcher then compared the P1s and P2s attitude toward mathematics.

Setting the confidence interval at 95% and degree of freedom 16, the hypothesis Ho:3 was accepted. That there is no significant
difference between teachers grade and teachers attitude toward mathematics Appendix XI and table 3 shows a summary for the sampled respondents.

The findings reveal that there is no significant difference between teachers' grade and teachers' attitude. Grade has no effect on attitude toward mathematics.

Attitudes are therefore developed earlier in life so the effect of training teachers as P1s or P2s has no influence on the teachers attitudes which had been formed earlier. ... this study has revealed

(iv) The last sub-hypothesis considered in this study was:

**Ho:4** "There is no significant difference between pupils' sex and pupils' achievement in mathematics."

Pupils can learn and perform better in mathematics if they have positive attitudes toward that subject. However pupils will not be able to learn easily or perform well if they have negative attitudes towards the subject. From low mean scores in the OMAT6 - the achievement test, it shows that pupils have a general fear for mathematics and so mathemaphobia syndrome, which results into low achievements for both boys and girls.

Eshiwani (1975) conducted a research amongst high school pupils. He found that there is a sex difference in mathematics performance. Carey (1985) says that girls generally do not like mathematics. The negative attitudes toward mathematics by females have resulted in inferior achievement.
Joffe and Foxman say that the analysis done so far does not reveal any significant difference in performance between boys and girls.

Plank and Plank (1954) revealed that boys perform better than girls. In this research, the analysis reveals that, Table 4 and Appendix XII.

The means of the girls scores per school was calculated for the 18 schools; then the mean of the means for all the girls achievement was calculated.

Similarly, this was done for the boys too.

The researcher found out that, the mean score for female pupils in mathematics was 41 while boys mean score was 43.3. Boys on the average performed better than the girls in the achievement test.

Girls variance was 146.5 while for boys the variance was 143.1, revealing that the boys had a closer mark range than the girls. The standard deviations were thus; girls 12.1 and boys 11.96, thus boys were a more homogeneous group.

Using the t-test:
The hypothesis is rejected.
So, "There is a significant difference between boys and girls achievement in mathematics."

Girls perform poorer than boys in mathematics. Boys are better achievers than girls in mathematics. This is in line with earlier findings by Eshiwani, Maritim and Kapio.

From the sub-hypothesis of this study it has been found that:
(i) There is a significant difference between teachers' experience and teachers' attitudes toward mathematics.

The findings show that, medium term (3–8 yrs experience) teachers have more favourable attitudes toward mathematics than the new term (0–3 years experience) teachers and the old term (over 8 yrs experience) teachers.

It has also revealed that the new teachers have a negative attitude toward mathematics than the other categories of teachers by years of service.

In fact out of the 3 groups O, M, the N group portrayed a mean attitude of 56.3 thus negative attitude toward mathematics while the other groups O and M had 63.2 and 65.2 respectively, thus all had mean positive attitudes toward mathematics.

(ii) In the second sub-hypothesis Ho:2: There is no significant difference between teachers sex and teachers attitude toward mathematics.
The investigation revealed the contrary thus rejecting the sub-hypothesis and accepting $H_0:2$: "There is a significant difference between male and female teachers' attitudes toward mathematics."

Much as both sexes had positive scores in mathematics, the males had a higher mean score than the females in the Attitude scale. But the female teachers were a more composed group as seen in table 2.

(iii) The third sub-hypothesis set in the study was "There is no significant difference between teachers' grade and teachers' attitude toward mathematics.

In general all grades of teachers portrayed positive attitudes toward mathematics. A comparison of P2 and P1 attitudes showed that there is no significant difference between the two grades of teachers' attitude toward mathematics, and so accepting the hypothesis. Both grades P1 and P2 scored positive attitudes towards mathematics. P2s are a more homogeneous group than P1s in terms of attitude scores as shown by standard deviation.

(iv) The fourth hypothesis of study was $H_0:4$: "There is no significant difference between pupils sex and pupils achievement in mathematics"

In this study, pupils were divided into 2 groups per school. These two groups were male and female pupils. The mean score per school for the boys and the girls were separately computed. Then the mean of the mans for girls got and also the mean of means for the boys. Table 4 summarizes the findings. The hypothesis was rejected at $X = 0.05$. 
So, "There is a significant difference between boys and girls achievement in mathematics." The boys are better achievers in mathematics than the girls. The mean scores for the two groups however was below the average pass mark of 50% showing that pupils in general are poor in mathematics.

The means for boys and girls respectively were 43.3 and 41 with standard deviation of 11.96 and 12.1

Eshiwani (1975) established a similar finding from his research on high school pupils achievement in mathematics; he found a significant difference in achievement in favour of the boys.

Using the t-test it was found that calculated t is less that table t, thus rejecting the hypothesis. So, there is significant difference between boys and girls achievement in mathematics. And the achievement is in favour of the boys

\[
H_a: \bar{x}_M > \bar{x}_F
\]

The mean score by the boys is superior to the mean score by the girls.
It is of interest to note from these findings that teachers' attitudes seem to alternate. Such that new teachers (0-3 yrs) have less favourable attitudes toward mathematics, and the middle teachers (3-8 yrs) have a more favourable attitude toward mathematics. This again changes as the teachers become old in the service (over 8 yrs) and they again elicit less favourable attitudes toward mathematics. Female teachers have less favourable attitudes toward mathematics than their male counterparts; and there exists a significant difference in their attitudes toward mathematics.

As for teachers' grades, the researcher through this investigation found no significant difference between grade and attitude. All grades of teachers elicited mean positive attitudes toward mathematics; so grade has no influence on teachers attitude.

In analysing pupils' sex and pupils' achievement in mathematics, this research established that: girls are poor achievers in mathematics than boys. Boys are better in mathematics achievement test than girls. So girls have a tendency to give up mathematics to the boys. However, both mean marks obtained by both sexes in OMAT6 were below the pass mark of 50% showing that mathematics is generally feared by pupils.

Finally, the research rejected the fourth hypotheses and justified the null hypothesis Ha: Thus Ha: "There is a significant difference in achievement in mathematics by the pupils and their teachers' attitudes toward mathematics." Pupils who are taught by teachers with negative attitudes toward mathematics performed poorer in mathematics than those taught by teachers who have positive attitudes toward mathematics.
Pupils acquire attitudes from their teachers. If the teacher has a negative attitude toward a subject he will sell his attitudes to his pupils. So attitudes are learned in the process of pupils interacting with their teachers.

In the case of an urban society like Kisumu Municipality, most children have more contact with their teachers than with their parents. So what happens is that most of the developed habits are as a result of the school environment other than home environment. Therefore the attitudes acquired about a subject are more of teacher origin than parent origin.

RECOMMENDATIONS OF THE STUDY

This study has provided information that should be used to bring possible modifications for the following improvements:

1. For teachers to promote achievement amongst their pupils in Mathematics, they must themselves have developed positive attitudes toward Mathematics, during their training.

2. The teacher trainee syllabus for Mathematics should be geared toward developing positive attitudes toward Mathematics and therefore must be well served with methods of teaching Mathematics which will promote positive attitudes in the trainees.

3. Teachers should be allowed to choose subjects of interest to teach instead of being assigned any subject at primary level;

4. Primary teacher trainee subjects should be optional to enable the trainees to specialize in a few subjects of their choice; as that is where their interests lie so have positive attitudes in.

5. Teachers O-level grades should be taken into account when assigning teachers to teach Mathematics.
6. Girls should be encouraged to take Mathematics seriously;

7. Teachers should be inserviced regularly to keep them abreast with new reforms in mathematics, content and methodology, so as to motivate them and promote positive attitudes in mathematics.

This study therefore recommends a more effective mathematics curriculum as a basis for developing positive attitudes toward Mathematics in our primary schools and primary teacher colleges.

Provide an input in choosing the objectives for mathematics instruction in our primary schools,

provide an additional base for establishing the logical base that positive attitudes toward mathematics play on important role in contributing to mathematics Achievement in pupils.

Provide a base to support the Nation that attitudes change and that teachers' attitudes influence pupils' attitudes and hence pupils achievement in mathematics.

4:6 RECOMMENDATIONS FOR FURTHER RESEARCH

There is need for further research to establish this study by sampling teachers of same grade over a wider area and a larger coverage of sample than this.

The teachers attitudes toward mathematics need to be studied in relation to their O-level mathematics grades.

Factors affecting teachers attitudes toward mathematics need to be established.

Parental contribution toward pupil achievement in mathematics should be studied and established. Further study to determine attitude change by teachers after a period of service need to be done. This study shows changes in attitude from negative for new teachers, then positive for medium and less favourable for old-service teachers (over 8 years).
Through its nature therefore, this study has provided information in the relative status of teachers and their attitudes toward Mathematics and pupils achievement in Mathematics and will assist curriculum developers and organizers in designing a more relevant Mathematics curriculum for TTCs geared toward promoting positive attitudes in Trainee Teachers toward Mathematics.

The following improvements are recommended from the study:—

1. Improvement in methodology in TTC Mathematics Programme to develop positive attitudes;

2. Use qualified Mathematics teachers to teach Mathematics;

3. Girls to be encourage to develop positive attitudes toward Mathematics, so as to favourably compete with boys;

3. Teachers must locate specific skills that their pupils lack and concentrate on these to improve pupils' attitudes and achievement in mathematics.

The attitudes held against girls as concerns Mathematics by teachers are bound to influence the kind of interaction between female pupils and their teachers. This association is strengthened by sex of mathematics teacher. The kind of interaction between male teachers and female pupils might be different from that between female teachers and female pupils.

When girls sit with boys, there is a possibility of girls giving up to boys in mathematics as this research has established, thus low achievement in mathematics by the girls.
Eshiwani (1975) showed that;

"Girls learning in single sex schools are almost comparative to boys in mathematics performance."

Wamani (1980) found that;

"No sex difference in performance in mathematics from pupils of 11 years and below."

This study has established the relationship between teachers' attitudes toward mathematics and their pupils' achievement in mathematics.

---

1 Eshiwani: G.S;  
"Sex Difference in the Learning of Mathematics Amongst Kenya High School Students" - 1975

2 Wamani;  
"Sex Differences and performance in Mathematics"  
- 1980
<table>
<thead>
<tr>
<th></th>
<th>Author(s)</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>ESHIWANI; G.S.</td>
<td>&quot;Sex Differences in the learning of Mathematics among Kenya High School students - 1975.</td>
</tr>
<tr>
<td>2.</td>
<td>KRYSSTALL; A. and SAVAGE; M.</td>
<td>&quot;Training Teachers to Monitor Their Own Performance - 1976</td>
</tr>
<tr>
<td>3.</td>
<td>ESHIWANI; G.S.</td>
<td>&quot;Minimal Competencies in Mathematics - 1980 -</td>
</tr>
<tr>
<td>5.</td>
<td>EDUCATION IN AFRICA</td>
<td>&quot;A Study of Goals of Mathematics.</td>
</tr>
<tr>
<td>6.</td>
<td>SIFUNA; D.N.</td>
<td>&quot;Academic Achievement as a Predictor for Teacher Effectiveness Among Primary School Teachers in Kenya - 1986</td>
</tr>
<tr>
<td>7.</td>
<td>OKECH, J.G.</td>
<td>&quot;Analysis of attitudes towards Mathematics - 1986</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>10.</td>
<td>MARITIM; E:</td>
<td>&quot;Academic Self-concept and the Teacher Perception; Their relationships to Pupils Grade Attainment in Rural Kenya. - 1980</td>
</tr>
<tr>
<td>11.</td>
<td>IBID</td>
<td>&quot;School Achievement Issue and Problems - 1984</td>
</tr>
<tr>
<td>13.</td>
<td>IBID</td>
<td>&quot;Mathematics and Science Education in Kenya; A report to the NCEOP - 1976</td>
</tr>
<tr>
<td>15.</td>
<td>IBID</td>
<td>&quot;What Mathematics should All Students Master at the End of Compulsory Primary Education? - 1980</td>
</tr>
<tr>
<td>17.</td>
<td>IGAGA; J.M.</td>
<td>&quot;Teachers Attitudes (Problems and profession): Classroom Environment and Social Relations - 1985</td>
</tr>
</tbody>
</table>


21. TRIANDS; I.C. - Attitudes and attitude change - 1973

22. ORORA; I.M. - A study of attitudes of pupils and Teachers Toward Mathematics - 1985

23. MONDOH; H.A.M.O: - A Study of the Relationship between the sex of a child and his/her Mathematical ability - 1986


25. LYDA; W.J. & MORSE C.E. - Attitudes, Teaching Methods and Arithmetic Achievement.

27. LEARCH; H.H. - Arithmetic Instruction Changes Pupils attitudes Towards Arithmetic.
- Arithmetic Teacher - Vol 7 - 8
  1960 - 61, P. 119

28. JOHNSON; D.A. - Attitudes in the Mathematics Classroom.
- School Science and Mathematics
  - 1957 - P. 113

29. MARUBE; K.O.: - A study of Teacher Trainees.
Attitudes Towards Mathematics and their Tutors contribution to these attitudes. - 1985

30. KRAUP; J.: - Are Children's Attitudes Towards Learning Mathematics Really Important?
- School Science and Mathematics -
  1973, 73, P. 9 - 15

31. BELL; F.H. - The Elementary Mathematics and Content for Grades 1 - 8

32. BASHAM; H.M. and MURPHY; K. - Attitude and Achievement in Arithmetic.
- Arithmetic Teacher -
  Vol. 11 - 12 , P. 66 - 72.

33. KAPIYO; R.J.A. - An Investigation into the Relationship Between Mathematical Ability and Mathematical Achievement of STD 7 Children - Kenya P.82, 1982.
Mathematics Achievement

Each item was five Marks, so the maximum score will be 100 marks, and the minimum score 0.

Pass mark was calculated and the data analysed; to find the relationship between:

1. Pupils achievement and Pupils sex;
2. Pupils achievement and their teachers attitudes toward Mathematics.
APPENDIX I

O-MAT 6

Read the Instructions carefully, then answer the questions below.

1. You are going to take this test.
2. The test is for research purposes.
3. Do not write your name on the answer sheet.
4. The test will not reflect on your examination results.
5. Feel free and do your best.
6. Work fast and be accurate.
7. Choose the correct answer and put a tick in the correct box to the answer.
8. Provide the following information before you start the test, by putting a tick in the appropriate box about yourself.

<table>
<thead>
<tr>
<th>School</th>
<th>Sex</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOY</td>
<td></td>
</tr>
<tr>
<td>GIRL</td>
<td></td>
</tr>
</tbody>
</table>

Now answer all Questions below. Put a tick in the box corresponding to the correct answer.

Do all your work on the rough papers provided.

Time 40 Minutes.
1. Write in words 7,006,053

A. Seven Million, Six hundred thousand, fifty three
B. Seven hundred, six thousand, fifty three
C. Seven Million, Six Thousand and fifty three
D. Seven Million, Six Hundred thousand and fifty three.

2. Add

239742
160729
314526
603425

======

A. 1,308,322
B. 1,318,322
C. 1,318,402
D. 1,318,422

3. 531 farmers sold 25 bags of rice each. Each bag weighed 80kg. What was the total weight of rice sold?

A. 13275kg
B. 106,200kg
C. 42480kg
D. 44480kg
4. A School has enough beans for nine days. If there are 540 kg of beans in the School's store, how many kilograms of beans does the school consume each day?

A. 4860 kg
B. 70 kg
C. 540 kg
D. 60 kg

5. How long will a lorry travelling at an average speed of 45 km per hour take to cover 198 km? (Give your answer in hours).

A. 0.44 Hrs
B. 4.4 Hrs
C. 4.04 Hrs
D. 4 Hrs

6. Watte gave three-eighths of his land to his eldest son and then gave one-sixth to his second son. What fraction of the land did he give away?

A. \(\frac{13}{24}\)
B. \(\frac{43}{48}\)
C. \(\frac{5}{48}\)
D. \(\frac{5}{24}\)
7. Solve \( \frac{5}{12} - \frac{3}{8} \)

A. \( \frac{2}{4} \)
B. \( \frac{1}{2} \)
C. \( \frac{1}{24} \)
D. \( \frac{1}{24} \)

8. By how much is \( \frac{3}{4} \) greater than \( \frac{2}{3} \)?

A. \( \frac{1}{2} \)
B. \( \frac{8}{12} \)
C. \( \frac{9}{12} \)
D. \( \frac{1}{12} \)

9. Solve, \( \frac{5}{7} + \frac{2}{3} + \frac{1}{14} \)

A. \( \frac{30}{42} \)
B. \( \frac{61}{42} \)
C. \( \frac{8}{21} \)
D. \( \frac{8}{28} \)
10. Solve \( \frac{4}{2} - \frac{5}{8} + \frac{13}{16} \)

A. \( \frac{1}{16} \)

B. \( \frac{1}{9} \)

C. \( \frac{1}{16} \)

D. 0

11. What name do we give a triangle whose sides are all equal?

A. Isosceles triangle

B. Quadrilateral triangle

C. Equilateral triangle

D. Right Angled triangle

12. Find angle \( x \) in the figure below.

\[ 40^\circ \quad 60^\circ \]

A. 40

B. 50

C. 60

D. 80
13. Find $x$ if 

$$2x + 5x = 56$$

A. 7  
B. 9  
C. 8  
D. 6

14. Find $K$ if 

$$K \div 9 = 2$$

A. 18  
B. $\frac{2}{9}$  
C. 9  
D. $\frac{1}{9}$

15. Find the value of $M$, given that $5m + 7 - 2m = 28$ 

A. 14  
B. 3  
C. 21  
D. 7

16. If $\frac{1}{4}W + 3 = 5$ 

What is the value of $W$? 

A. 2  
B. 8  
C. 32  
D. $\frac{1}{2}$
17. Onyango is 3 times as old as his son. If the difference in their ages is 36 years. How old is the son?

A. 12  
B. 18  
C. 9  
D. 3  

18. A number is divisible by 9 if the sum of its digits is divisible by 9. Which of these numbers is divisible by 9?

A. 3264  
B. 4567128  
C. 3024  
D. 51232  

19. Find the G.C.D. of 45 and 60

A. 180  
B. 4  
C. 9  
D. 5  

20. Christine lives \(2 \frac{1}{4}\) km away from her school. If she goes to school in the morning and comes back in the evening, how many kilometres does she cover in 10 days?

A. \(20 \frac{1}{2}\) Km  
B. \(22 \frac{1}{2}\) Km  
C. 45 km  
D. 50 km
APPENDIX II

ANSWERS

1. C
2. D
3. B
4. D
5. B
6. A
7. C
8. D
9. B
10. C
11. C
12. D
13. C
14. A
15. D
16. B
17. B
18. C
19. D
20. C
Attitude Scale

For Positive items, the responses will be valued as follows:-

SA = 5,  A = 4,  N = 3,  D = 2,  S. D = 1 and vice versa for the negative items. This consideration will be used to score for each subject in every item that the subject will respond to. The total score for every subject will be found. A high score on the attitude scale will mean favourable attitude. Therefore, the agreement with the statement will be scored 4 or 5 and otherwise 1 or 2.
APPENDIX III

MAS-JT

Read these instructions carefully then answer the questions below:
You have been given a questionnaire to fill in what you think about mathematics.

There is no correct answer or wrong answer to any question
Just choose one adjective that suits your opinion by the question and round it.

From SA, A, N, D, SD - meaning
SA = Strongly Agree
A = Agree
N = Neutral
D = Disagree
SD = Strongly Disagree

Also supply the following information about yourself, by putting a tick (√) in the appropriate space.

<table>
<thead>
<tr>
<th>SCHOOL</th>
<th>SEX</th>
<th>GRADE</th>
<th>EXPERIENCE(YRS)</th>
<th>FOR OFFICIAL USE</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>UT</td>
<td>0 - 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>P3</td>
<td>0 - 8</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>P2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>P1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ATS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>GRAD</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1. Mathematics is particularly suited to develop independent and self-reliant habits of mind

2. Mathematics is harder work than most subjects

3. Mathematics are quicker to spot fallacies in arguments than non-mathematics

4. Mathematics must be taught in a rigorous deductive way

5. The study of mathematics cultivates powers of reasoning

6. The study of mathematics tend to dull the imagination

7. Mathematics is the simplest and most straightforward subject of all

8. Mathematics must be seen to be difficult if it is to be valuable

9. Mathematics is primarily a tool for use in other subject areas

10. The number of people with real mathematical insight is strictly limited

11. Female mathematics teachers are regarded by society as in some way peculiar
<table>
<thead>
<tr>
<th>Questions cont'd</th>
<th>SA</th>
<th>A</th>
<th>N</th>
<th>D</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>12. There is little scope for creativity in learning mathematics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Parents regard mathematics as one of the most important subject</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. School mathematics is too divorced from real world</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Mathematics teachers have higher social status than teachers in general</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Mathematics teachers should be concerned with applications of mathematics only</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Mathematics is the easiest subject to teach</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Mixed ability groups are too demanding in mathematics to be of real practical proposition</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. Mathematics is one of the most important subjects</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. Girls are, on the whole, incapable of becoming good mathematicians</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX IV

The t-test formula used is:

\[ t = \frac{\bar{x}_1 - \bar{x}_2}{s_{x_1} - s_{x_2}} \]

or

\[ t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{s_{x_1}^2 + s_{x_2}^2}} \]

where

\[ s_{x_1} = \frac{s_1}{\sqrt{n_1 - 1}} \]

\[ s_{x_2} = \frac{s_2}{\sqrt{n_2 - 1}} \]

and

\[ s_{x_1}^2 - s_{x_2}^2 = \sqrt{\frac{x_1^2}{n_1} + \frac{x_2^2}{n_2}} \]

C.I. = 95% \quad \alpha = 0.05

Value of t at 1.964

\[ \bar{x}_1 = \text{Mean score of the first variable being compared} \]

\[ S_{x_1} = \text{Standard deviation of the variable being compared with the other}. \]

\[ n_1 = \text{The number of items in the variables being compared.} \]

\[ S_{x_A} - S_{x_B} = \sqrt{S_{x_A}^2 + S_{x_B}^2} \]

for Category A and Category B teachers' pupil mean score in OMAT 6.
# APPENDIX V

## Teachers Years of Experience and Mean Attitude Score Per Category

<table>
<thead>
<tr>
<th>EXPERIENCE</th>
<th>0 - 3 YRS</th>
<th>3 - 8 YRS</th>
<th>OVER 8 YRS</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>3</td>
<td>6</td>
<td>11</td>
<td>20</td>
</tr>
<tr>
<td>( \bar{x} )</td>
<td>56.3</td>
<td>65.2</td>
<td>63.2</td>
<td></td>
</tr>
<tr>
<td>( s^2 )</td>
<td>80.34</td>
<td>30.57</td>
<td>53.96</td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>8.96</td>
<td>5.53</td>
<td>7.35</td>
<td></td>
</tr>
</tbody>
</table>
## APPENDIX vi

### Sex of Teacher and Score in the Attitude test

<table>
<thead>
<tr>
<th>Female</th>
<th>$X_F$</th>
<th>$X_F - X_F$</th>
<th>$X_M$</th>
<th>$X_M - X_M$</th>
</tr>
</thead>
<tbody>
<tr>
<td>75</td>
<td>156.25</td>
<td>70</td>
<td>47.61</td>
<td></td>
</tr>
<tr>
<td>73</td>
<td>110.25</td>
<td>67</td>
<td>15.21</td>
<td></td>
</tr>
<tr>
<td>71</td>
<td>72.25</td>
<td>67</td>
<td>15.21</td>
<td></td>
</tr>
<tr>
<td>69</td>
<td>42.25</td>
<td>65</td>
<td>3.61</td>
<td></td>
</tr>
<tr>
<td>65</td>
<td>6.25</td>
<td>65</td>
<td>3.61</td>
<td></td>
</tr>
<tr>
<td>62</td>
<td>0.25</td>
<td>64</td>
<td>0.81</td>
<td></td>
</tr>
<tr>
<td>58</td>
<td>20.25</td>
<td>61</td>
<td>4.41</td>
<td></td>
</tr>
<tr>
<td>57</td>
<td>30.25</td>
<td>58</td>
<td>26.01</td>
<td></td>
</tr>
<tr>
<td>55</td>
<td>56.25</td>
<td>51</td>
<td>146.41</td>
<td></td>
</tr>
<tr>
<td>51</td>
<td>132.25</td>
<td>568</td>
<td>263.89</td>
<td></td>
</tr>
</tbody>
</table>

\[
\bar{X}_F = 62.5 \\
S_F^2 = 75.875 \\
S_F = 8.71 \\
N_F = 11
\]

\[
\bar{X}_M = 63.1 \\
S_M^2 = 32.986 \\
S_m = 5.743 \\
N_m = 9
\]
### APPENDIX vii

**TEACHERS GRADE AND MEAN ATTITUDE SCORE**

<table>
<thead>
<tr>
<th>GRADE</th>
<th>UT</th>
<th>P3</th>
<th>P2</th>
<th>P1</th>
<th>S1</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>1</td>
<td>-</td>
<td>3</td>
<td>15</td>
<td>1</td>
<td>20</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>( \bar{X} )</th>
<th>67</th>
<th>-</th>
<th>69.3</th>
<th>61.3</th>
<th>67</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>( S^2 )</th>
<th>0</th>
<th>-</th>
<th>16.34</th>
<th>51.1</th>
<th>0</th>
</tr>
</thead>
</table>

| S          | 0  | -  | 4.04  | 7.15 | 0  |


CURRICULUM VITAE

1. GENERAL INFORMATION

Place of Birth: South Nyakach, Kisumu District, Nyanza Province, KENYA

Date of Birth: 1956

Religion: Catholic

2. ACADEMIC QUALIFICATIONS

1970: C.P.E. Nyabondo Primary

1974: EACE I Nyabondo Secondary

1976: EAACE Maseno High School

3. PROFESSIONAL QUALIFICATIONS

1980: B.ED (Sc) - Kenyatta University

4. EXPERIENCE

Has taught in the following Institutions:

1980 - 1982: Siriba Teachers College

1982 - 1986: Migori Teachers College

1986 - 1986: Kapsabet B.H. School

5. 1986 - 1988: Masters of Education student Kenyatta University

(MATHEMATICS/ENVIRONMENTAL EDUCATION)
## Workplan

<table>
<thead>
<tr>
<th>No.</th>
<th>Subject</th>
<th>Month</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Writing Proposal</td>
<td>March/April</td>
<td>22/3 - 10/4</td>
</tr>
<tr>
<td>2.</td>
<td>Typing Proposal</td>
<td>April/May</td>
<td>11/4 - 15/5</td>
</tr>
<tr>
<td>3.</td>
<td>Proof Reading</td>
<td>May/June</td>
<td>16/5</td>
</tr>
<tr>
<td>4.</td>
<td>Piloting</td>
<td>May/June</td>
<td>20/5 - 30/5</td>
</tr>
<tr>
<td>5.</td>
<td>Submission of proposal</td>
<td>May/June</td>
<td>30/5 - 3/6</td>
</tr>
<tr>
<td>6.</td>
<td>Letters to M.E.O. Kisumu</td>
<td>June</td>
<td>3/6 - 4/6</td>
</tr>
<tr>
<td>7.</td>
<td>Collecting Data</td>
<td>June</td>
<td>5/6 - 10/6</td>
</tr>
<tr>
<td>8.</td>
<td>Data Analysis</td>
<td>June</td>
<td>11/6 - 30/6</td>
</tr>
<tr>
<td>9.</td>
<td>Writing Project</td>
<td>July</td>
<td>1/7 - 15/7</td>
</tr>
<tr>
<td>10.</td>
<td>Typing of Project</td>
<td>July</td>
<td>16/7 - 26/7</td>
</tr>
<tr>
<td>11.</td>
<td>Proof Reading</td>
<td>July</td>
<td>26/7 - 30/7</td>
</tr>
<tr>
<td>12.</td>
<td>Photocopying</td>
<td>August</td>
<td>1/8 - 3/8</td>
</tr>
<tr>
<td>13.</td>
<td>BINDING</td>
<td>August</td>
<td>4/8 - 6/8</td>
</tr>
</tbody>
</table>
Mr. Onyango J.A. Melcio
Kenyatta University
Com/Tec. Dept.
P.O. Box 43844
NAIROBI.

The Municipal Education Officer
Kisumu Municipal Council
Education Department,
P.O. Box 105,
KISUMU.

Dear Sir,

RE: AUTHORITY TO CARRY OUT RESEARCH

I am writing to inform you that I have been granted authority to carry out a research study in Kenya by the Office of the President. Your schools have been selected as the sites of the study. This is a scientific educational research to be carried out in my personal capacity, with the support of Kenyatta University, Department of Com/Tec. The study is designed to investigate the relationship between teachers' attitudes towards mathematics and pupils achievement in mathematics. It is hoped that the results of the study may be of help to the teacher trainees and teachers themselves, not to mention parents, pupils and curriculum planners of Kenya Primary Schools.
Letter to M.E.O. Cont'd

The main purpose for writing this letter is to inform you that I will visit your schools any time starting from May to August 1988. During this visit which is expected to take 2 or more weeks, two tests will be administered. One to std.6 pupils and one to the standard 6 mathematics teachers.

I therefore request you to inform your schools and the appropriate classes and the ir teachers to co-operate when I visit them.

Thanking you in advance.

Yours faithfully,

ONYANGO JAMES A. MELCIO
## Appendix xi

### Time Table

<table>
<thead>
<tr>
<th>Week</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. WEEK I</strong></td>
<td>- Administration of the MAS-JT to the Teachers.</td>
</tr>
<tr>
<td></td>
<td>- Scoring MAS-JT</td>
</tr>
<tr>
<td></td>
<td>- Categorizing the Teachers as A and B</td>
</tr>
<tr>
<td></td>
<td>- Randomizing to select 5 from category A and 5 from category B.</td>
</tr>
<tr>
<td></td>
<td>- Analysis of Data obtained from MAS-JT</td>
</tr>
<tr>
<td><strong>2. WEEK II</strong></td>
<td>- Administration of the O-MAT-6 to standard 6 pupils.</td>
</tr>
<tr>
<td></td>
<td>- Marking the OMAT6 scripts</td>
</tr>
<tr>
<td></td>
<td>- Ranking</td>
</tr>
<tr>
<td></td>
<td>- Analysing the data</td>
</tr>
<tr>
<td></td>
<td>- Comparing scores from those of categories A and B</td>
</tr>
<tr>
<td><strong>3. WEEK III</strong></td>
<td>- Writing Report of Project</td>
</tr>
<tr>
<td></td>
<td>- Data Analysis</td>
</tr>
</tbody>
</table>