INFLUENCE OF TEACHERS' ASSESSMENT PRACTICE IN ENHANCING PERFORMANCE IN MATHEMATICS AMONG SECONDARY SCHOOL STUDENTS IN MOMBASA DISTRICT, KENYA

BY

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Kwaka d k
influence of
teachers' assessment
DECLARATION

This thesis is my original work and has not been presented for a degree in any other university.

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DEDICATION

This work is dedicated to my family and my parents for their support in my education.
I wish to express my sincere gratitude to all those who positively rendered their support to this study. Most importantly, I thank God the almighty to whom all my success relies on.

Many thanks to my supervisors: Dr. S.M Rukangu and Dr. H.E Embeywa who selflessly devoted their time in guiding and advising me to ensure the success of the study. Their willingness to work extra hours enabled me to finish this work on time.

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I am indebted to all the teachers of mathematics who participated in this study for their cooperation. I am also grateful to the educational administrators for permitting me to carry out the research. The list is too long to permit individual mention but this does not indicate any dilution of gratitude.

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ABBREVIATIONS AND ACRONYMS

ANOVA – Analysis of Variance

K.C.S.E. – Kenya Certificate of Secondary Education

K.I.E. – Kenya Institute of Education

K.N.E.C. – Kenya National Examinations Council

NCTM – National Council of Teachers of Mathematics

P.D.E. – Provincial Director of Education

INSET – In-service Education of Teachers

M/M – Married Male

S/M – Single Male

M/F – Married Female

S/F – Single Female

P1 – Primary Teacher One

S1 – Secondary Teacher One

Dip. Ed. – Diploma in Education.

B. Ed. – Bachelor of Education
ABSTRACT

One of the objectives of every system of education is to improve the welfare of every individual and the society at large. This may be achievable if performance of the learners in all academic disciplines is taken into consideration. This study focused on teachers’ assessment practice as a factor influencing performance of students in mathematics in secondary schools. It was taken with full knowledge that students perform poorly in mathematics in the K.C.S.E. examinations.

The study investigated the assessment practice of teachers of mathematics in secondary schools in Mombasa District, Kenya. The study aimed at determining the procedures used in assessing students in mathematics and the coverage in mathematics teachers’ tests. Also, the frequency of assessment and the teacher’s use of assessment results among others were examined. Each aspect was discussed separately and its influence in performance of students in mathematics was considered.

The study was influenced by the increasing concern of poor performance in mathematics at secondary school level. Although a number of authors have addressed some issues relating to assessment, teacher’s assessment practice has not been critically considered at least in the Kenyan context. The study aimed at doing exactly that using a sample from Mombasa District, Kenya.

A cross-sectional survey research design was done using three instruments for data collection. These were the mathematics teacher’s questionnaire (MTQ), lesson observation schedule (LOS) and document analysis sheet (DAS). The validity and reliability of the instruments were enhanced by a pilot study and the adoption of some already validated items. A reliability coefficient of at least 0.8 was acceptable for the study. The instruments were administered by the researcher to secondary school teachers of mathematics in Mombasa District who were by then handling form three classes. A
total of twenty-nine teachers were sampled for the study. Data were analysed using both qualitative and quantitative methods.

The main findings among others were that:

a) Teachers assessed students mainly for formative and summative reasons. Those who also emphasized on diagnostic assessment besides formative and summative assessment produced better scores at the end-of-term examinations.

b) Most teachers were aware and used a variety of techniques in assessing their students. However, project work and practical work were rarely used. Similarly, teachers assessed all cognitive domains of learning but creativity and imagination as well as data interpretation domains were less emphasized. This denied the students an all-round mathematics learning.

c) Teachers of mathematics were seen to be lax in using assessment results. Lack of proper assessment records such as assessment scores, analysis of the results, remarks on students’ progress and target setting was likely evidence to this. The use of assessment results was also seen to have a contribution to the performance of students in mathematics.

The discussions on the findings towards enhancement of performance in mathematics are given. The key recommendation was that there is the need to have a national policy to govern all aspects of assessment. If this is enforced, it would enhance performance of students in mathematics.
CHAPTER ONE
INTRODUCTION

1.0 Introduction

This chapter focuses on the background of the study, the statement of the problem and significance of the study with regard to the role of teachers' assessment in enhancing performance in mathematics. It then highlights the assumptions, scope and limitations of the study as well as giving definitions of terms and abbreviations.

1.1 Background to the study

Mathematics is an important subject and as such many countries have made it a compulsory subject at both primary and secondary school tiers of education. In Kenya, making mathematics one of the determinants for the entry to most tertiary courses and careers has been emphasized. Mathematics is taken as a prerequisite subject of study in all colleges that offer scientific and business courses. Similar emphasis is seen in the requirements for most of the job opportunities that are advertised. This has therefore put pressure on mathematics teachers to ensure that students acquire the basic knowledge and skills in the subject. The importance of mathematics, therefore, makes its assessment practice unique in order to develop the required skills. This study was meant to show how Kenya's examination-oriented system of education might require teachers' assessment to make a significant improvement in the students' performance in mathematics.

Performance in mathematics among students in Kenyan secondary schools has been very poor over the years. Wangethi (28/2/2002:8) rightly states that:
... the poor results in key subjects illustrate that there is a problem with learning and teaching. It is a matter of concern that the mean performance in mathematics, for example, is still under 20 percent. This means that there is need to improve on this performance. This was the essence of the study with a view that assessment practice by teachers of mathematics would be a significant factor.

In Mombasa District (the study area), the performance in mathematics has similarly been poor (Republic of Kenya, Coast Provincial Education Office, 2002). The mean score of the candidates in the district at K.C.S.E. level in 2001 was 3.41 out of 12 maximum points. In the same year, only 6.2% of the candidates obtained a grade of B+ and above, while 66.2% of them had a grade D and below as shown in table 1.1.

Table 1.1 Mombasa District 2001 K.C.S.E. mathematics results analysis

<table>
<thead>
<tr>
<th>Grade</th>
<th>A</th>
<th>A-</th>
<th>B+</th>
<th>B-</th>
<th>C+</th>
<th>C</th>
<th>C-</th>
<th>D+</th>
<th>D</th>
<th>D-</th>
<th>E</th>
<th>Total</th>
<th>M.S</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of students</td>
<td>75</td>
<td>37</td>
<td>48</td>
<td>65</td>
<td>71</td>
<td>132</td>
<td>138</td>
<td>143</td>
<td>157</td>
<td>334</td>
<td>425</td>
<td>938</td>
<td>2563</td>
</tr>
<tr>
<td>Percentage</td>
<td>2.9</td>
<td>1.4</td>
<td>1.9</td>
<td>2.5</td>
<td>2.8</td>
<td>5.2</td>
<td>5.4</td>
<td>5.6</td>
<td>6.1</td>
<td>13.0</td>
<td>16.6</td>
<td>36.6</td>
<td>100</td>
</tr>
</tbody>
</table>


Table 1.1 indicates that the performance of mathematics in Mombasa District is very poor. This poor performance could suggest that students do not master mathematical concepts. Mathematics educators all over the world have had discussions in many fora on ways of improving performance by enhancing the mastery of the concepts. In Kenya, even after implementing the recommendations contributing to poor performances such as
inappropriate syllabus and over enrolment among others, poor results in mathematics continue to persist (Rukangu, 2000). While these recommendations are important, there could be yet another critical and key one which contributes to students’ mastery of mathematics concepts. This may be teacher’s assessment practice in mathematics. The researcher therefore felt that a study on the effectiveness of the assessment practice by teachers may offer some meaningful information on the problem of poor performance in mathematics.

Teachers at their disposal have several instruments for assessing their students. These include oral tests, written tests, observation and assignments. These instruments can provide a large coverage of content as prescribed by the course objectives if the frequency with which they occur as well as the spread over the learner’s whole learning period is effectively done. This therefore could help the students to master the required knowledge and skills in line with the requirements of the Kenya National Examinations Council (KNEC). In addition, teachers’ assessment instruments can assess the learner’s ability in all the process strands of mathematics learning including application and making connections; reasoning and logic; modelling and use of technology as well as communicating mathematical ideas.

In view of the above, it can be said that teachers’ assessment can develop all the domains of learning through use of projects and observation of student’s work, compared to external assessment which mainly measures cognitive domain (Kempa, 1986). The researcher therefore felt that the study on teachers’ assessment practice in mathematics may enable us realise its impact in the development of students in all domains of learning.
and hence leading to improved performance in mathematics. Thus, the study was designed on the understanding that inadequacies in the instruments used to assess students’ learning may present a barrier to the performance shift. The study was therefore aimed at determining whether or not teachers practised the assessment procedures emphasised by Kenya Institute of Education (K.I.E.) such as regular homework, continuous assessment tests and projects among others.

Assessment practice has interchangeably been viewed as ‘testing’ and ‘evaluating’. Different scholars have looked at these concepts so as to make a clear distinction between them. Sumner (1991) defined a test as one consisting of a task or series of tasks given to a pupil according to prescribed objectives. The pupil’s response is then subjected to a scoring or a classificatory procedure by an assessor to make an inference about the pupil, usually in respect to a particular attribute. National Council of Teachers of Mathematics (1995) defined evaluation as a process of determining the worth of or assigning a value to something on the basis of a careful examination and judgment. Phillips (1968); Sutton (1991); NCTM (1995) and Sumner (1991) have defined assessment as a way of providing information to be used in decision-making.

From the above definitions, it can be seen that the terms test and evaluation refer to forms of gathering assessment information. Assessment is generally seen to put emphasis on the processes and products, which describe the nature and extent of students’ learning and how this corresponds to the aims and objectives of teaching. Assessment practice in mathematics can therefore be seen as a process of describing what mathematics students know and can do. It can provide learners, assessors and other mathematics educators with
insight about themselves when there is appropriate feedback. This makes assessment practice part of the required expertise for a mathematics teacher, hence crucial to effective teaching and learning. It is important for educators to understand these assessment-related terms and how they can lead to improvement in teaching and school practice and in the event may contribute to effective learning of new knowledge and skills in mathematics. The study was meant to help in bringing about the understanding of the relationship of these assessment-related terms, which will further enable teachers to have valid means of assessing their students’ achievement and hence an improvement in performance in general and mathematics in particular.

1.2 Statement of the problem

Majority of the secondary school students perform poorly in their Kenya Certificate of Secondary Education (K.C.S.E.) examinations in mathematics. Work done by Eshiwani (1983) in an attempt to improve the performance has cited various causes of poor performance. These include attitude of students towards mathematics, teaching methods employed by teachers and lack of resources. Even after many attempts have been made to counter these factors, including the introduction of external and internal assessment (Mocks) and extra coaching, the situation has not shown significant improvement in the performance. This means that the real cause of poor performance has not been identified and therefore necessitating more research.

It is in view of this gap, that the researcher felt that assessment procedures used by teachers of mathematics, which have not been systematically studied at least in Kenyan context, might significantly contribute to understand the causes of poor performance of
students in mathematics. The study focused on the assessment practices by secondary school teachers of mathematics in order to establish the link between assessment and students' performance in mathematics.

1.2.1 Conceptual framework

Assessment is an important process in the learning and as such an integral part of the teaching process. It helps teachers to determine the extent to which the educational objectives have been achieved. Learning cannot be said to have taken place in any situation unless the teacher gets some feedback from the students to determine the attainment of his instructional objectives. The objectives can be achieved through the use of appropriate teaching methods and proper selection and use of learning resources. The researcher further felt that appropriate techniques of assessment would be required for effective teaching as well as feedback in ensuring that the objectives are achieved. This therefore, makes assessment processes in schools to have a contribution to the performance in mathematics.

Poor assessment processes are likely to be as a result of the techniques used by teachers, training of teachers and the resources available for appropriate assessment practice. These and other relevant causes are shown in figure 1.1.
Figure 1.1 Conceptual focus on teacher’s assessment in educational development

**Problem**
Poor performance in mathematics

**Possible factors**

<table>
<thead>
<tr>
<th>Assessment practice</th>
<th>Teaching methods</th>
<th>Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>Overuse of lecture</td>
<td>Inadequate stationery</td>
</tr>
<tr>
<td>Mode</td>
<td>Poor demonstration</td>
<td>and equipment</td>
</tr>
<tr>
<td>Content tested</td>
<td>Inadequate discussion</td>
<td>Insufficient textbooks</td>
</tr>
<tr>
<td>Use of results by teachers and students</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Intervention**
- In - servicing teachers on assessment skills
- Provision of assessment resources
- Change in teacher - training curriculum with emphasis on assessment practice.

**Impact**
- Improved performance in Mathematics
- Improved teaching methods
- Improved teachers’ knowledge of students

Figure 1.1 shows how assessment, if well incorporated in the learning process may have a significant bearing in the achievement of course objectives and hence an improvement in the performance. It also shows the way performance may be affected by various determinants such as resources, training and assessment procedures.
Intervention measures as shown in figure 1.1 are necessary if assessment is to bring meaningful results. These can effectively be done through in-servicing of teachers and emphasizing assessment in the teacher-training curriculum. Also, sensitising educational authorities on the need to provide adequate resources for the required assessment techniques is necessary. These taken into consideration may in turn enhance performance as well as provide good teaching practice in the learning of mathematics.

1.3 Objectives of the study

The study aimed at determining the following:

1. The practice used by teachers of mathematics in assessing students in secondary schools.

2. The relationship between teacher’s assessment practices and final outcome of the students’ end of term examination in mathematics.

1.4 Research questions

The study addresses itself to the following basic questions:

1. What modes of assessment do secondary school teachers of mathematics use?

2. What proportion of the syllabus is covered by the teachers’ assessment tests in mathematics?

3. What proportion of secondary school teachers effectively use the assessment data in teaching mathematics?

4. How frequently do teachers assess their students in mathematics?

5. What levels of cognitive development do teachers of mathematics commonly assess?
6. What is the relationship between the teachers’ assessment practices and the end of term results in mathematics?

1.5 Significance of the study

The study focused on teacher’s assessment practice in secondary schools in mathematics. The knowledge of this and its enhancement of performance have great significance in the educational development of the country. The findings of the study are therefore significant to:

(a) Educational administrators

Educational administrators are charged with the responsibility of monitoring learning programmes in schools. The findings will help them to ensure appropriate and meaningful assessment techniques in mathematics are used in secondary schools. This can be done in collaboration with heads of mathematics department and teachers of mathematics.

(b) Policy makers

The educational policies have been changing over a period probably due to findings that emanate from research. The findings of this study will also assist the policy makers to reconsider the existing policies especially on teacher training with a view to guiding them on assessment practice. The findings of the study will also assist in the formulation of policy guidelines on assessment techniques to be used in secondary schools that will be useful to educational administrators, teachers and students.
(c) The mathematics teacher

As the implementers of all research inputs related to academic excellence in schools, the teachers will find much assistance in the findings. The findings will provide the teachers with appropriate information on ways of assessing their students in order to enhance the performance of their students in mathematics.

(d) Students of mathematics

Students have a responsibility of responding to the learning activities and utilization of time for proper guidance. The findings will increase students’ awareness of the assessment techniques used in learning of mathematics. This may lead to improved learning strategies and achievement in mathematics.

1.6 Scope and limitations of the study

1.6.1 Scope

The study focused on techniques of assessment practised by teachers of mathematics in secondary schools in Mombasa District that offer the 8 - 4 - 4 curriculum.

1.6.2 Limitations

The study is limited to some selected secondary schools in Mombasa District. This reflects the situation in Mombasa District and possibly of the Coast Province, but paves way for further studies in other regions. Funds and time were also a limitation to this study. All the same, the available resources were optimally used to minimize these limitations.

1.7 Assumptions of the study

The following are assumptions of this study.
(a) That most teachers of mathematics are professionally trained.

(b) The respondents will provide accurate responses to the questionnaire and produce all records deemed necessary by the researcher.

(c) The end of term examinations in mathematics are valid and reliable.

1.8 Definition of terms

In the study, the following terms have been defined for the purpose and with the intentions as explained in this section.

Educational administrators – refers to all those persons involved with monitoring learning programmes in schools such as principals of secondary schools and the Inspectorate Department of the Ministry of Education.

Performance – means the student’s ability to think, reason and solve problems and that is indicated by the score attained in the mathematics assessments.

Policy makers – refers to all the stakeholders in educational planning such as the senior officials of the Ministry of Education as well as the parliamentarians who are involved in formulating policies in education.

Teacher assessment – refers to the process of gathering and providing information to the learner about his or her performance on learning tasks made and used by the learners’ teacher.

1.9 Organization of the thesis

The thesis has five chapters. Chapter one outlines the context of the study including the background, statement of the problem, study objectives, research questions, significance of the study, scope and limitations and definition of terms.
Chapter two reviews literature with regard to the study. It considers views of those who have researched on assessment including performance trends, types and techniques of assessment in schools as well as the usefulness of assessment in teaching of mathematics.

Chapter three provides the research methodology. It includes the design and location of the study, sampling methods, research instruments and data collection procedures and the rationale of choosing them.

Chapter four presents, analyses the data collected and discusses the results. The discussions are based on the research questions touching on all assessment variables mentioned in the study.

Finally chapter five summarises the findings and gives conclusion of the study. Also suggestions for additional research are given. A bibliography and appendices are presented at the end of the thesis.

1.9 Chapter summary

This chapter looked at some of the factors that influence students’ performance in mathematics in secondary schools in Kenya. The main focus was on the teachers’ assessment practice as a fundamental factor enhancing performance in mathematics. Included in the chapter are the background to the study and statement of the problem that highlighted several themes such as the poor performance and the importance of mathematics in daily life. Also, significance, assumptions, scope and limitations of the study were highlighted. Issues relating to assessment practice in Kenya are reviewed in the next chapter.
CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter reviews literature related to the study on the subject of assessment. In particular, some issues relating to teachers’ assessment practice in mathematics in secondary schools are emphasized to show how they impact on the performance of students. The review does not only concentrate on the historical development of assessment procedures in educational institutions, but also discusses various assessment types, techniques and their use as tools in effective teaching of mathematics. Trends of performance in mathematics in Kenya are reviewed to ascertain the need for the study.

2.1 Trends of mathematics performance in K.C.S.E

School achievement bears direct relationship to some occupational achievement (Sovchik 1996). This implies that good performance in mathematics will result in competence in mathematical related career. In Kenya, such relationship has given certification a high value. Consequently, good performance in mathematics and science-related subjects have been encouraged in schools, because they are gateways to many careers and professions (Republic of Kenya, 1985). However, students’ performance in mathematics has been poor as can be seen in K.C.S.E. examinations, where the mean score/marks of the candidates has consistently been below 20% (see table 2.1).
Table 2.1 National K.C.S.E mathematics performance (1989 – 2001)

<table>
<thead>
<tr>
<th>YEAR</th>
<th>NO. OF CANDIDATES</th>
<th>MEAN SCORE (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1989</td>
<td>131727</td>
<td>11.84</td>
</tr>
<tr>
<td>1990</td>
<td>133251</td>
<td>13.51</td>
</tr>
<tr>
<td>1991</td>
<td>136733</td>
<td>17.02</td>
</tr>
<tr>
<td>1992</td>
<td>138743</td>
<td>12.46</td>
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<tr>
<td>1993</td>
<td>141816</td>
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<td>143315</td>
<td>12.84</td>
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<td>1995</td>
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<tr>
<td>1996</td>
<td>155019</td>
<td>18.12</td>
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<tr>
<td>1997</td>
<td>153107</td>
<td>16.31</td>
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<tr>
<td>1998</td>
<td>166553</td>
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<tr>
<td>1999</td>
<td>172018</td>
<td>12.23</td>
</tr>
<tr>
<td>2000</td>
<td>178607</td>
<td>16.24</td>
</tr>
<tr>
<td>2001</td>
<td>193815</td>
<td>18.72</td>
</tr>
</tbody>
</table>


Table 2.1 shows that the candidates’ numbers have been increasing steadily over the years. On the other hand, the performance has not been steady. There have been fluctuations on the average performance ranging from 11% to 19%. This implies that a proper solution of arresting the plummeting performance has not been addressed. It is in this context that this study investigated the teacher’s assessment practice with a view to determining their contribution to the solution to this problem.

It can further be noted that performance of students in mathematics has been indicating a higher percentage of students in the lower grades and a very small percentage of them in
the higher grades. By taking any two years at random, such as 1995 and 2001, the evidence is as shown in table 2.2 below.

Table 2.2 Analysis of students' national performance in K.C.S.E. mathematics in 1995 and 2001

<table>
<thead>
<tr>
<th>Year</th>
<th>Total no of students</th>
<th>A</th>
<th>A-</th>
<th>B+</th>
<th>D</th>
<th>D-</th>
<th>E</th>
<th>A - B+</th>
<th>D - E</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>140503</td>
<td>1105</td>
<td>812</td>
<td>1413</td>
<td>15706</td>
<td>30968</td>
<td>66405</td>
<td>3330</td>
<td>113079</td>
</tr>
<tr>
<td></td>
<td>0.79%</td>
<td>0.58%</td>
<td>1.01%</td>
<td>11.18%</td>
<td>22.04%</td>
<td>47.26%</td>
<td>2.37%</td>
<td>80.48%</td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>193815</td>
<td>3252</td>
<td>2098</td>
<td>2830</td>
<td>25407</td>
<td>40914</td>
<td>75421</td>
<td>8170</td>
<td>141742</td>
</tr>
<tr>
<td></td>
<td>1.68%</td>
<td>1.08%</td>
<td>1.46%</td>
<td>13.11%</td>
<td>21.11%</td>
<td>38.91%</td>
<td>4.22%</td>
<td>73.13%</td>
<td></td>
</tr>
</tbody>
</table>


The table above shows the percentages of students that obtained higher and lower grades. It can be noted that in 1995 and 2001 alone, 80.48% and 73.13% of the students respectively, scored the lower grades of 'D' plain and below, while in the same years only 2.37% and 4.22% of the students scored 'B+' and above respectively. It can also be deduced that the average grades of between B and D+ were obtained by a very small percentage of the students in both years. This shows that majority of the secondary school leavers are very much below average in their mathematical skills. There is therefore need for a change in the approach of teachers of mathematics in their process of instruction. It is from this that the researcher felt that emphasis on teacher’s assessment could be a viable tool of instruction to enhance students’ acquisition of the necessary mathematical skills.
The performance of mathematics in Mombasa District (the study area) is a reflection of the national performance with a higher percentage of students with the lowest grades while a very small percentage has the better grades as was shown in table 1.1. This means that there is a need for mathematics educators to rethink on the issue and initiate a workable solution. The teacher's assessment practice may offer this solution. The study was aimed at looking at assessment practice in the district and the extent to which it could be a contributing factor towards this performance trend.

This poor performance trend, as shown in tables 2.1 and 2.2, implies that on the average teachers do not achieve their objectives. Consequently, Kenya as a nation is likely to produce a generation with less competence in mathematics. The implication here is that, there is likely to be deficiencies of competent professionals like engineers, scientists, doctors, accountants, technologists and many other professionals in mathematics related fields. This could be detrimental to the technological advancement of the country hence may affect the dream of industrialisation in the near future.

Despite other reasons for poor performance such as attitude and facilities (Eshiwani 1983), it is felt that teachers' assessment practice can offer a more comprehensive solution by making teachers to be more responsible for this anomaly than they already are. This can be done by giving evidence of the knowledge and skills that they have been trying to promote in their students especially through the assessments they administer to the students.
Assessment practice can be more useful if teachers apply their knowledge of educational measurement and evaluation effectively. In a global context, Wood (1987) observes that teachers are often deficient in methods of assessment. He further observes that in teacher-assessed examinations, majority of students display higher performance than is normally the case in external examination. This could be attributed to poor assessment practice. The limited research in teacher assessment practice in Kenya cannot confirm or dispute the above statement. There is therefore a need for research in Kenya into the area of teacher assessment particularly with regard to their input in making their students perform well in their examinations. It is in this view that the study was undertaken to highlight the practice of teachers in assessing their students.

2.2 Historical development of assessment

Formal assessment procedures have been used for over 4000 years in various countries. Chinese officials were conducting examinations by the year 2356 BC as a basis of admission in the civil service (Riding & Butterfield, 1990). Oral examinations were by then the accepted method of assessing. Over the years, assessment has been used for as long as learning has been taking place. The origin of formal education, therefore, can be equated to the origin of assessment and as stated by Ludville (1961), that educational assessment is as old as the first attempt of a person to teach something to another.

Formal written examinations came into force in the 18th century when the British government introduced the civil service written entrance examinations in the 1850s. Thereafter, the universities of Oxford and Cambridge introduced school examinations in 1877 and began issuing school certificates (Riding and Butterfield 1990). All along,
formal examinations in schools have been going on all over the world. In Kenyan educational system, examinations have been and still are a dominant feature, making it an examination-oriented system, hence ‘that which is not assessed is not valued’ (Pirie, 1988). It is therefore a measure of learning product not part of the learning process. This is not the case in the developed countries and Kenya therefore needs to re-examine this situation with a view to improving on it so as to make learning in general and that of mathematics in particular more meaningful.

Presently, the role and methods of assessment in mathematics have been changing over time the world over from formal to informal-based assessment. The change has been necessitated by changes in the kind of mathematics that is taught and the role it is to serve in the changing technological advancement in various countries. Particularly, in some countries such as the United States of America, Britain and Japan among others, changes have been from assessment of the product of learning to a process-based assessment in which what the learner had learnt was assessed within the learning process. This marked the starting point of the focus on the teacher’s role in assessment. There is an increased participation of teachers in the assessment of their students hence it has become part of the learning process of mathematics. This emphasis is due to the fact that teacher’s assessments are broader in coverage. Eaglestone (1969:1) emphasised this by stating that:

In some countries ... it is accepted that the teacher is likely to know more about his students than an external examiner and that he can provide more information about them than a necessarily short examination can hope to do.

This means that assessment by the teacher does not need to be a written test only but a variety of procedures. It can take place during every lesson, hence keeping the teacher at
a better position to comment on a student's ability. Cockcroft (1982:161) further challenged the exclusive use of the timed, pen and paper examination practice when stating that:

Exams in mathematics which consist only of timed written papers cannot by their nature, assess ability to undertake practical and investigational work or ability to carry out work of an extended nature. They cannot assess skills of mental computation or ability to discuss mathematics other than in very limited ways, qualities of perseverance and inventiveness. Work and qualities of this kind can only be assessed in the classroom and such assessment needs to be made over an extended period.

This implies that the teacher is the only resourceful person that can accurately judge the progress of the student based on the results of his assessments and is also in a better position to influence this progress. The study therefore examined the teacher's interpretation of assessment results to determine their relationship with the performance of students in mathematics.

Teachers of mathematics in Kenya are widely expected to have incorporated the modern trends of assessment in their teaching. There is no documented evidence to show the extent to which teachers of mathematics in Kenya employ these modern trends of assessment. It is in view of this gap that the study sought to highlight the assessment practice by teachers of mathematics with a view to establishing the extent to which modern assessment procedures are used in Kenya.

2.3 Types of teacher's assessment in schools

There are two major categories of assessment used in education. These are formative and summative assessment. Summative assessment is done after a programme has been
completed. It is concerned with identifying what has been achieved. It implies a judgment on the outcome of previous learning. This type of assessment is designed to determine the extent to which the instructional objectives have been achieved and is used primarily for assigning course grades or certificating students’ mastery of the intended learning outcomes (Gronlund, 1985).

On the other hand, formative assessment is carried out throughout a course of study. It is used to provide continuous feedback and guide to both students and teachers, in influencing the shaping of the curriculum through successive revision. Thus, it looks forward to the students’ learning needs. Over the years, many scholars among them Sumner (1991); Sutton (1991); Benoars et. al (1994) and the National Council of Teachers of Mathematics (1995) have emphasized on the importance of formative assessment in schools. One form of formative assessment is the continuous assessment tests. The Ministry of Education in Kenya, through its sessional paper No. 6 of 1988, promised to consider continuous assessment of students’ work in all subjects as part of the national examination and most significantly to be an important feature of the 8:4:4 system of education. Whether continuous assessment is considered to be part of the process in mathematics in Kenyan secondary schools or not was to be established by this study.

In both categories, the apparent uses of the results determine the type of assessment. All types of assessment are geared towards illuminating rather than removing the uniqueness of the student and as well providing feedforward and feedback so that all recipients of information can make effective decisions about future action (Sutton, 1991). The various
types of assessment mentioned by Ridding and Butterfields (1990), Sumner (1991) and Ridgeway (1987) emanate from the two major categories of educational assessment mentioned above. These types include:

a) **Norm - referenced assessment:**

This type reports on a student’s position with respect to other students who have been similarly assessed. In this case, special credence is given to the distribution of scores provided by the population or representative samples, so that individual’s scores are interpreted as a rank order relative to all others. The purpose of assessment within a norm-referenced framework is grading, ranking and comparing (Sumner 1991). It is not designed to generate specific information about what an individual student knows, understands and can do irrespective of other children. This is and has been the traditional form of assessment in Kenya. The study examined how the teachers effectively use this assessment type to influence their students’ performance.

b) **Criterion - referenced assessment:**

This type of assessment sets out to judge whether a student has been able to perform some well-defined tasks to an acceptable standard or not. The emphasis is on attainment and mastery (Rigdeway 1987). The use of the criteria will often involve continuous assessment. This will emphasise the feedback to students that is possible only in formative assessment. It therefore ensures that the student moves to the next level only when it is desirable. The study sought to find out the frequency with which teachers of mathematics do this.
c) **Ipsative – referenced assessment:**

This assessment type is a process by which a student’s performance is measured against own previous performance. The interest is only on that particular student regardless of any expectations we may have of any other student. It is a student-centered assessment type. The effectiveness of this assessment type might be revealed by the study.

d) **Diagnostic assessment:**

This type of assessment sets out to classify students’ conceptions and misconceptions (Ridding and Butterfields 1990). Its chief purpose is the identification of the underlying problems or difficulties from the features of a student’s performance. This is in a view to development of remedial programme or indicates where further teaching is required.

Teachers’ understanding of all these types of assessment may enable them to make meaningful decisions on assessment modes to apply. The knowledge of whether teachers of mathematics in Kenya effectively apply these types of assessment in schools had not been documented. There was need therefore for a study to closely examine assessment practices with a view to finding out the contribution of their assessment in the performance of their students.

2.4 **Techniques of assessment in schools**

Successful teaching involves periodic assessment at every stage for different purposes. There are a number of techniques that teachers can use to obtain feedback about students’ progress during instructional process. These techniques are not limited to giving of paper and pen tests but any device that provides evidence regarding the progress of students
towards educational objectives is appropriate. The Kenya Institute of Education (1986) as well as Bishop (1985) and Spooncer (1983) listed a number of assessment techniques that should be used by teachers to enable them find out the extent to which students have acquired and developed desired knowledge, skills and attitudes. These techniques, which can be used to assess students' performance in mathematics and other subjects include.

a) Quizzes:
These are assessments, which are either written or orally given where students are expected to respond without prior notice. They are administered in an informal setting and mainly on a particular concept. This technique is aimed at enabling the teachers determine the level of understanding of the materials learnt.

b) Written tests:
These are a set of questions aimed at testing a wide range of knowledge and comprehension tasks. High-level abilities such as reasoning and problem solving can also be assessed adequately by this method.

c) Written assignments:
This is a way in which a teacher evaluates a student’s daily work. A careful study of student’s work will give the teacher information about their skills in performing routine tasks and how well they understand what they are doing. It gives immediate knowledge about the student’s readiness for the next lesson.
d) Projects:

This is a powerful tool since it has the ability to assess unique domains on which other methods fail. It can assess the student’s attainment in the creative and attitude domains of mathematics. Despite its strengths, this technique has various limitations. Deere (1974), puts it that it is difficult to measure the contribution of the individual student where a project is carried out in a group. Also, the assessment of ‘how’ of the final product will pose a challenge to the teacher since some students may work on their projects outside the school. It is therefore the duty of the teacher using this method to make a clear criterion of assessment in each domain.

e) Observation:

Observing each student during class discussions, tests and work periods may pay big dividends. This is because, it reveals about a student’s interest in and attitude towards mathematics, knowledge and understanding of the subject and application of mathematics in problem-solving situations (Kennedy and Tipps, 1988).

f) Oral questioning:

This can be spontaneous or a planned interview. It is useful when a new student transfers into a classroom so as to give the teacher an idea of where to start the instructions for the student. It is also useful when a teacher observes a student with a unique method or has an idea of how to approach a problem situation. This may help the teacher identify the student’s thought process in order to provide appropriate support for the process or idea.

The above techniques have been suggested and encouraged especially with the introduction of the 8–4–4 system of education. There has been no research carried out
to find out the extent to which teachers of mathematics apply these techniques. It is in view of this context that the study sought to find out which of the above techniques, as cited by the researcher, are used by secondary school teachers of mathematics and how this relates to the performance of their students.

2.5 Use of assessment as a tool for effective teaching of mathematics

An effective classroom teacher is one who is able to assess his or her students at any given time. This view is supported by Ebel (1979) when he says that periodic assessment of educational progress is essential to effective education and that tests afford very useful assistance to teachers in planning their teaching activities. Both formative and summative assessment procedures mentioned earlier are designed to be carried out for a defined purpose as deemed fit by the teacher.

Diagnostic assessment, which is often informal and impressionistic, is useful to both the teacher and the student since it may identify areas where students need additional support. Thus, a ‘system’ of diagnosis can be applied in teaching as part of assessment and consequently the outcome of the assessment is not an end in itself but a guide to remedial action if required (Black and Devine, 1986). The diagnosis in a way helps in describing the teaching strategies to overcome misconceptions and hence assist in effective teaching.

Assessment may also be used to motivate students. Ridding and Butterfields (1990) view formative assessment as being able to bring about competition between students, which in turn will spur them to greater efforts. The students will also gain confidence and
direction from the feedback and in turn foster a good classroom management, which is vital in a competitive environment for effective teaching.

Besides competition, if assessment information is recorded on an ipsative basis, that is, by reference to the student’s own past performance, it may encourage individual students. This will bring about individual academic discipline in an effort to improve one’s performance and thereby make teaching and learning of mathematics interesting and results oriented.

Norm – referenced assessment can help evaluate the performance of his or her students with respect to national average performance. This will enable the teacher to realise his strengths and weaknesses in application of teaching methods and materials to conform to national standards and thereby assist his or her students to perform well. The study sought to find out the role teachers’ assessment play in assisting students to improve their performance.

The quality of a school is often determined by the academic performance of its students. The criteria of determining the quality of a school and its educational functions would be the extent to which it achieves its objectives (Bloom, 1971). These objectives are achieved only if students perform well. The contention of this study is that incorporating assessment in teaching can significantly enhance the achievement of the educational objectives. The extent to which this is done by teachers of mathematics had not been documented in Kenyan context. It was in this view that the study sought to investigate how teachers of mathematics incorporate assessment in their teaching with a view to achieving the desired objectives.
It is worth suggesting that participation of teachers in selecting and constructing assessment modes results in improved instruments on one hand and clarification of objectives of instructions and making them meaningful on the other hand. Thus, it can be further argued that when teachers have actively participated in constructing assessment tools, they in turn face learning problems with great vigour and remarkable creativity for possible solutions. The extent to which teachers in Kenya actively participate in the construction of the assessment tools had not been investigated. The study therefore examined how teachers construct these tools and how they can effectively handle learning problems and hence improve students' performance.

2.6 Chapter summary

In this chapter, the trend of mathematics performance since the inception of the 8 – 4 – 4 system of education has been analysed and seen to be poor and inconsistent hence not useful if mathematics is to stir technological development of this country. Other studies related to teacher assessment have been looked at including the historical development of assessment to its present status in Kenya and the developed world and various changes in assessment have taken place.

Types and techniques of assessment have also been considered and the study sought to find out the extent to which teachers of mathematics use these techniques and their contribution to performance of students. The use of assessment as a tool in teaching of mathematics has been looked at as being important in enhancing performance of students. The next chapter will explore the methods used in carrying out this study.
CHAPTER THREE
METHODOLOGY

3.0 Introduction
This chapter discusses the processes that were undertaken to achieve the objectives of the study by considering the design and the methods used in the study. Specific methods of data collection so as to answer the research questions are highlighted. The main sections include:

- Sample and sampling techniques
- Research instruments
- Piloting
- Data collection procedures

3.1 Study Design
This study used a cross-sectional survey design. This design was chosen because it is good in obtaining both qualitative and quantitative data with regard to the assessment practice undertaken by teachers of mathematics in secondary schools. It also involved observing teachers in their actual practices of assessment. The summary of the study is shown in figure 3.1.
Figure 3.1 summarises the design for the study. It shows the population from which the sample was obtained and the methods of sampling. Also, research instruments used and the process involved in the entire research are shown.
3.2 Study location

The research took place in Mombasa District of Coast Province. The choice of the district was due to the fact that it had a similar distribution of average performance of students in mathematics as the national one in terms of percentages of students obtaining certain grades. Though this is not unique to Mombasa District only, the choice was further attributed to the familiarity of the district to the researcher, which was to enhance efficiency by making it easy to locate the sampled schools.

The suitability of the district was also due to the fact that schools are found within a convenient proximity where movement between them was easy and less costly to the researcher. This in turn was to increase efficiency in the administration of the instruments. Similarly, its wide sampling strata, that is, all categories required in sampling the schools by the researcher could be conveniently found in the district.

3.3 The sample and sampling procedure

3.3.1 Study population

The study population was the secondary school teachers of mathematics in Mombasa District. The district had twenty-nine (29) secondary schools with forms one to four and offering the 8–4–4 curriculum. However, only form three teachers of mathematics were considered for the study. This is the stage where teachers assess their students in line with the K.C.S.E. examination in mathematics. Also, assessment practice in form three would cover a wide spectrum of the secondary school mathematics syllabus since it includes all the work done from form one.
3.3.2 Sample size
In this study, the main sources of information regarding assessment practice were the form three teachers of mathematics. Twenty-nine (29) teachers (one from each school in the district) were sampled for the study. This is in line with Morgan’s table of sample size decision (Sekaran, 1992). Then a smaller group of six (6) teachers were further sampled from their schools according to school type and performance for administration of lesson observation schedules (LOS).

3.3.3 Sampling techniques
Stratified sampling technique was used to select the schools according to their school type and their performance in the last three years’ K.C.S.E. examinations in mathematics. This stratification was done with the view that assessment practice in mathematics may vary with school type and performance of schools. The stratification by the school type was as follows:

   a) Boys’ schools
   b) Girls’ schools
   c) Mixed schools

These strata were further classified according to school’s previous performance in K.C.S.E mathematics examination as follows:

   i) Good performing with mean grade of C- and above
   ii) Poor performing with mean grade of D+ and below

Generally, the distribution of the stratified population is as shown on table 3.1
### Table 3.1 Population grid

<table>
<thead>
<tr>
<th>Performance criteria of schools</th>
<th>Type of schools (No.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boys</td>
</tr>
<tr>
<td>Good performing</td>
<td>4</td>
</tr>
<tr>
<td>Poor performing</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>6</td>
</tr>
</tbody>
</table>

In each category, one school was sampled (as shown in table 3.2) using “Lucky – dip” type of simple random sampling technique for the categories with more than one school to avoid any bias. For those categories with only one school, purposive sampling was used.

### Table 3.2 Sampling grid

<table>
<thead>
<tr>
<th>Performance criteria of schools</th>
<th>Type of schools (No.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boys</td>
</tr>
<tr>
<td>Good performing</td>
<td>1</td>
</tr>
<tr>
<td>Poor performing</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 3.2 shows how the six schools were sampled from the population. In each of the sampled schools, only form three classes were considered. Only one stream per form (class) was randomly chosen from those schools with more than one stream, while for
those with only one stream, purposive sampling was used. This gave a total of six teachers sampled.

3.4 Research instruments

The major tools of the study were:

a) A mathematics teachers’ questionnaire (Appendix A)

b) Lesson observation schedule (Appendix B)

c) Document analysis sheet (Appendix C)

a) Mathematics Teacher’s Questionnaire (MTQ)

The purpose of this questionnaire was to find out the assessment procedures that are used by teachers of mathematics in Mombasa District. It was used because of its objectivity and its potential in providing a lot of information from respondents even in the absence of the researcher. It consisted of two parts: i) Teacher’s background and ii) General assessment procedures.

Part one provided information on the teachers’ educational and professional background as well as about the school. Part two was the main part for the study and it sought information about the assessment practice by teachers of mathematics.

b) Lesson Observation Schedule (LOS)

A lesson observation schedule was used to provide information on various assessment practices that take place in the mathematics classroom. It involved observing lesson introductory questions, supervised practice as well as assignment (homework).
c) Document analysis sheet (DAS)

A document analysis sheet was used to provide information about the assessment procedures, frequency of teachers' assessment and the level of cognitive development of the assessment items. This information was obtained from the analysis of records checked in various documents including schemes of work, mark books, test papers and their marking schemes as well as students' exercise books. The information so obtained helped in establishing the relationship between assessment practice and the performance of students in mathematics.

3.5 Validity and Reliability

Content and construct validity of the research tools were enhanced at the design stage since some of the items were adapted from earlier studies by Ochanji (2000) and Osundwa (2000). The pilot study further improved the level of the instruments' validity especially in the appropriateness of the language used in the tools.

Reliability coefficient of all instruments was determined after piloting stage using Cronbach coefficient formula as used by Rukangu (2000). Thus

$$\alpha = \frac{n}{n-1} \left( 1 - \frac{\sum s^2}{\sigma^2} \right)$$

Where, $\alpha$ = reliability coefficient

n = number of items in the tool

$\sigma^2$ = variance in the obtained test scores

$\sum s^2$ = sum of the variances of the single items.
This coefficient formula is appropriate since the tools have non-dichotomous scores. A reliability coefficient of at least 0.8 was acceptable for the study. Thereafter more refinement was done to enable the researcher to determine the difficulty of the items in the instruments as well as checking the difficulty of the language used. This further enhanced the validity and reliability of the items.

3.6 Piloting

Piloting was carried out in four schools, which were randomly selected from the secondary schools in the district. The teachers involved were not among the ones sampled for the study. During the piloting all instruments were administered and their reliability coefficient determined. Necessary adjustments were made to improve on the instruments before the actual data collection. The pilot study also assisted the researcher to gain the administrative ability and confidence necessary for the actual survey.

3.7 Variables

The following are the main independent variables used in this study. These variables influenced the dependent variables as explained below.

a) Teacher-related variables: These variables include academic and professional background, INSET attendance, teaching load and teaching experience. Other variables such as teaching styles and resources used in class were also considered in the study.

b) School-related variables: These variables include the type and whether boarding or day schools. Resource availability and the school policy on assessment were necessary in the study.
The main dependent variables used in this study are the assessment related ones. These include:

i) Modes of assessment

ii) Content coverage in assessment

iii) Uses of assessment data

iv) Frequency of assessment

v) Aspects of learning assessed

3.8 Data collection

The schools were visited to notify the authorities as well as distribute the questionnaires. They were collected later in the course of the same term. The questionnaires were distributed to the twenty-nine (29) sampled form three teachers of mathematics in the district at the time of study.

Observation schedules were administered the following week and five lesson observations were done for each of the sampled teachers so as to enable the researcher obtain a reasonable data regarding classroom assessment. The researcher made one observation per week for every teacher. Observation schedules were conducted on the six (6) teachers in the sampled schools.

Documentary analysis was done for all the necessary documents available including schemes of work, mark books, past test papers and their marking schemes as well as students’ exercise books towards the end of the term. This was done for all the teachers who were issued with the questionnaires.
The process took two months, that is, October and November. At the end of the term, the end of term results were obtained and analysed.

3.9 Ethical considerations

The researcher sought permission from the Office of the President and the Coast Provincial Director of Education's office to do research in the schools. Also, the municipal education administration was consulted before conducting the study. In each secondary school visited, further permission was sought from the headteacher before involving its teachers. The consent of the respondents was sought before they were engaged in the process.

3.10 Chapter summary

This chapter has described the rationale of the design and methods that were adopted for the study. It has looked at the research instruments used and how they enhanced the acquisition of information on various aspects of teachers' assessment. The information that was obtained and how it was analysed is explained in the next chapter.
5.0 Introduction

This chapter gives a summary of the findings after which conclusion, recommendations and suggestions for further additional research are made.

5.1 Summary of the research findings

a) Modes of assessment

i) It was found out that most teachers generally assess their students during the lesson. It was further found out that there was a weak correlation between assessment procedures during the lesson and performance of students in mathematics. More so, teachers who cared for individual differences in their assessment had their students performing better.

ii) Most teachers assessed their students using various testing techniques. Though there was seen to be no significant influence between the uses of some techniques (written tests, oral tests and homework) on performance of students, it was found out that student whose teachers also used practical work and project work performed better than those who did not.

iii) Teachers generally looked for most aspects of diagnostic analysis of performance while marking assessment test. It was further found out that the aspects of diagnostic analysis of performance that were examined significantly influenced performance of students in mathematics. The schools whose teachers properly examined all aspects performed better than those that did not.
Data from lesson observations were mainly described qualitatively. This considered the inferences that were made from the opinions of the respondents. The analysis was presented narratively and where possible in tabular form.

In both techniques, each teacher-assessment variable was separately presented in a frequency table. The results for each variable were then grouped according to students' performance at the end of term giving poor and good performing school categories. Teachers whose classes had a mean grade of D+ and below had their responses put under the poor performing school category while those with a mean grade of C- and above were in the good performing category. This analysis provided an explanation on the various assessment practices done by teachers of mathematics.

Further analysis of the data was done using one-way ANOVA method. In this case differences in the means of the assessment variables were made between the assessment practice of teachers in the poor and good performing schools. This was aimed at investigating the relationship between performance of students in mathematics and the teachers' assessment practices.

4.2 Modes of assessment

4.2.1 Lesson assessment procedures

The way teachers assessed their students during a mathematics lesson was considered in the questionnaire as well as in the observation schedule. Teachers were asked to indicate how they assess their students based on three point Likert scale. A score below two (2)
disagrees with the method while that above two (2) agrees with that particular method. A score of two (2) is the average and neither agrees nor disagrees. Table 4.1 shows such mean scores and percentages of teachers who used the given lesson assessment methods in both poor and good performing schools as well as the overall.

**Table 4.1 How teachers assessed their students during mathematics lessons**

<table>
<thead>
<tr>
<th>Assessment during a lesson</th>
<th>Poor performing schools</th>
<th>Good performing schools</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>All students do exercise from class texts during each lesson</td>
<td>2.53</td>
<td>2.83</td>
<td>2.66</td>
</tr>
<tr>
<td>All students are given same work during each lesson</td>
<td>2.65</td>
<td>2.45</td>
<td>2.57</td>
</tr>
<tr>
<td>All exercises done are marked by the teacher before the next lesson</td>
<td>2.65</td>
<td>2.45</td>
<td>2.57</td>
</tr>
<tr>
<td>Teacher gives extra lessons to weaker students*</td>
<td>2.00</td>
<td>2.36</td>
<td>2.15</td>
</tr>
<tr>
<td>Teacher asks brighter students challenging questions</td>
<td>2.00</td>
<td>2.36</td>
<td>2.15</td>
</tr>
</tbody>
</table>

*ANOVA, (f = 22.183, p = 0.000), at α = 0.05

Table 4.1 indicates that in overall teachers of mathematics agree with all lesson assessment techniques given. In particular teachers in both poor and good performing schools mainly have all their students doing exercise from class textbooks during each lesson, give same work to all students during each lesson and mark all exercises done by their students. Inspite of these similarities, there are some disparities in the emphasis of particular modes between the poor and good performing schools.
The good performing schools emphasized on all students doing exercise from class texts during each lesson, while their counterparts in poor performing schools emphasized on giving all students same work during each lesson and marking the exercise done. The disparity in emphasis may be due to the fact that the good performing schools have a variety of texts to use hence can rely on them unlike the poor performing schools. The emphasis on giving same work during each lesson to students in poor performing schools confirms that the teachers do not properly take care of the individual needs of the students but instead generalizes the students' abilities in class. Similarly, despite the more emphasis on marking all the exercises done by the students in the poor performing schools than in the good performing schools, the poor performance may suggests that these teachers do not effectively use the results to influence the students by revising and emphasizing on the students' areas of weakness. This therefore leads to poor performance.

Unlike teachers in good performing schools, those in poor performing schools neither agree nor disagree on giving extra lessons to weaker students and challenging questions to brighter students as indicated in the table where the mean score is two (2). This clearly underscores the importance of providing for individual differences in class. Further analysis using one - way ANOVA method indicates that there is a significant difference on how teachers perceived the practice of giving extra lesson to weaker students between good and poor performing schools ($F = 22.183, p = 0.000$). This difference in teachers' consideration for individual difference contributes significantly to the differences in performance of students in their schools. Thus, teachers of mathematics should be aware
of this deficiency and hence effectively assess all their students during the lesson by choosing assessment items from a variety of texts as well keeping in mind each student’s ability. Proper planning of the lesson can do this.

Classroom observation further revealed that teachers carry out supervised practice well as well as encourage students to ask questions. It was further noted that more often than not, teachers in poor performing schools did not ask oral questions constantly to ensure attentiveness for both slow and fast learners. This implies that teachers in poor performing schools do not emphasize on the learner-centered approach of learning. In most cases, this leaves the students out of the lesson and eventually no learning takes place. There is need for the teachers in poor performing schools to involve the learners constantly throughout the lesson if they are to master the necessary knowledge and skills and hence improve their performance.

4.2.2 Techniques of assessment

The sampled teachers were provided with a variety of techniques of assessment and were required to indicate the ones that they used in assessing their students. This is information based on performance of students in their schools is summarized in table 4.2.
Table 4.2 Teachers’ use of various assessment techniques

<table>
<thead>
<tr>
<th>Techniques</th>
<th>Poor performing schools</th>
<th>Good performing schools</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of teachers</td>
<td>%</td>
<td>No. of teachers</td>
</tr>
<tr>
<td>Written tests</td>
<td>16</td>
<td>94.1</td>
<td>12</td>
</tr>
<tr>
<td>Practical work</td>
<td>10</td>
<td>58.8</td>
<td>11</td>
</tr>
<tr>
<td>Project work</td>
<td>9</td>
<td>52.9</td>
<td>10</td>
</tr>
<tr>
<td>Oral questions</td>
<td>15</td>
<td>88.1</td>
<td>10</td>
</tr>
<tr>
<td>Homework</td>
<td>16</td>
<td>94.1</td>
<td>12</td>
</tr>
<tr>
<td>Observation</td>
<td>10</td>
<td>58.8</td>
<td>10</td>
</tr>
</tbody>
</table>

Table 4.2 shows the frequencies and percentages of teachers who used the various techniques in assessing their students. It can generally be noted from table 4.2 that overall most teachers use written tests and homework (both 96.6%). The other techniques were also commonly used: practical work (72.4%), project work (65.5%), oral tests (86.2%) and observation (69.0%). This implies that the teachers were aware of the need to use a variety of techniques of assessment. The most commonly used techniques of written tests, homework and oral questions are mainly for acquisition of knowledge and facts, which though useful are not sufficient for good learning of mathematics. There is need for students to develop other domains of mathematics. Though all the methods are commonly used, their effective application may differ among the teachers and hence the differences in performance of students in mathematics.
It can further be noted that about 94% of teachers sampled from the poor performing schools used written tests and homework in assessing their students. Only about half of those sampled used practical work (58.8%), project work (52.9%) and observation (58.9%). On the other hand, the results for teachers in the good performing schools indicate that all those sampled used written tests and homework in assessing their students with practical work (91.7%), project work and observation (83.3%). This shows that the percentages of teachers using various techniques differ in the two categories of schools. Most teachers in good performing schools used practical work, project work and observation of students in assessing their students than their counterparts in poor performing schools. This may be a contributing factor to the differences in performance of students in these school categories.

Practical tasks, project work and observation of students are used to assess the process and creative domain of mathematics learning as described by Bloom (1956). In particular, project work assesses application of mathematical knowledge, creativity, imagination and manipulation while practical work is a more versatile method and assesses mainly feelings and values towards mathematics besides all other aspects of learning. These methods complement the commonly used methods in the quest to develop all aspects of mathematics learning. There is therefore need for more teachers in poor performing schools to emphasize the use of all these techniques so as to develop their students in all round mathematics learning and hence improve their performance in mathematics.
4.3 Content coverage in assessment

Another aspect of teacher assessment that was of concern to this study was the proportion of content taught that is assessed in the tests. It is in this view that the teacher’s test items were further examined against their records of work covered to find out the proportion of coverage of the areas taught. The proportions in percentages of the content covered that were tested and the number of teachers whose tests for the term corresponds to the proportion indicated are summarized and presented in table 4.3. Tests for teachers in both good and poor performing schools were grouped accordingly and the overall results also included.

Table 4.3 Proportion of work taught that is assessed

<table>
<thead>
<tr>
<th>Proportion of assessed work in a term (%)</th>
<th>Poor performing schools (N = 17)</th>
<th>Good performing schools (N = 12)</th>
<th>Overall (N = 29)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>0 - 20</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>21 - 40</td>
<td>10</td>
<td>58.9</td>
<td>3</td>
</tr>
<tr>
<td>41 - 60</td>
<td>3</td>
<td>17.6</td>
<td>4</td>
</tr>
<tr>
<td>60 - 80</td>
<td>3</td>
<td>17.6</td>
<td>3</td>
</tr>
<tr>
<td>Over 80</td>
<td>1</td>
<td>5.9</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 4.3 indicate that more teachers (44.8%) assess between 20 – 40 % of the content covered within the term while only 24.1% assess between 41 – 60%, 20.7% between 61 – 80% and 10.3% assess over 80% of the content covered. This implies that teachers generally do not adequately assess the content they teach in the term. This assessment is insufficient and does not assist the students in discovering much of their weaknesses in the term’s work, thus leading to poor performance.
It can further be noted that 58.9% of the teachers in poor performing schools assessed their students in the content taught by only 21 – 40%. The good performing schools have more teachers (70%) assessing over 40% of the work taught compared to those in the poor performing schools (41.2%). This may imply that teachers in poor performing schools assess their students merely as a school routine but not to acquire mastery of mathematical concepts. For the students to learn effectively there is need for assessment practices that include most of the content taught during the term. Thus, this can be realized if teachers list all the concepts they have covered in the term and provide test items for each. This will enhance performance of their students.

The proportion of content taught that is assessed could also depend on the sources of items for assessment. It was from this that teachers were asked to rate all sources of items in their assessment tests giving one (1) point to the least used and eight (8) to the most used source. Table 4.4 shows the mean rating of all sources of items used in assessment tests in mathematics as well as their positions ranging from the most used source in position eight (8) to the least used in position one (1).
Table 4.4 Sources of items in assessment tests

<table>
<thead>
<tr>
<th>Sources</th>
<th>Poor performing schools</th>
<th>Good performing schools</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean source rating</td>
<td>Position rating</td>
<td>Mean source rating</td>
</tr>
<tr>
<td>New items personally constructed</td>
<td>5.0</td>
<td>5</td>
<td>4.73</td>
</tr>
<tr>
<td>Previous tests*</td>
<td>5.35</td>
<td>6</td>
<td>4.64</td>
</tr>
<tr>
<td>Tests from other schools**</td>
<td>4.41</td>
<td>3</td>
<td>6.27</td>
</tr>
<tr>
<td>Textbooks</td>
<td>5.76</td>
<td>7</td>
<td>5.75</td>
</tr>
<tr>
<td>Past K.C.S.E papers</td>
<td>6.18</td>
<td>8</td>
<td>6.33</td>
</tr>
<tr>
<td>Commercially produced papers</td>
<td>3.41</td>
<td>2</td>
<td>2.75</td>
</tr>
<tr>
<td>Other teachers in the department</td>
<td>4.71</td>
<td>4</td>
<td>4.92</td>
</tr>
<tr>
<td>Other sources</td>
<td>1.18</td>
<td>1</td>
<td>1.92</td>
</tr>
</tbody>
</table>

*ANOVA (F = 6.905, p = 0.014), Significant at α = 0.05

**ANOVA (F = 19.308, p = 0.000), Significant at α = 0.05

It is generally evident from table 4.4 that the teachers used the past K.C.S.E papers in both good and poor performing schools for selecting items for testing their students. Textbooks, personally constructed items as well as other teachers in the department substantially provided sources for assessment tests to both teachers in poor and good performing schools. These sources, though seeming to be similar, differ in their quality especially in the use of the textbooks. Types and varieties of the sources may provide differences in scope of assessment and hence can influence performance of students.

Other than the general agreement in the sources of items used, there is a significant difference in the use of items from previous tests between teachers in poor and good...
performing schools as shown in the table by use of one-way ANOVA ($F = 6.905, p = 0.014$) at $\alpha = 0.05$. Specifically it can be seen that teachers in poor performing schools more commonly use these items than their counterparts in good performing schools. This implies that teachers recycle their own assessment items over the years, an action which does not reflect assessment of the ability of students at the time. Thus, this may be a handicap since it does not appreciate the dynamism of assessment. Assessment ought to test the learners’ levels of understanding as well as reflect an improvement from the previous performance, hence instruments need to differ with time.

Similarly, more teachers in good performing schools than in the poor performing ones commonly used items from tests done by other schools. One-way ANOVA method of analysis at $\alpha = 0.05$, indicated that there is a significant difference in the use of items from tests done in other schools by teachers in both poor and good performing schools ($F = 19.308, p = 0.000$). This difference implies the use of these items may influence performance of students in mathematics. It is worth noting that the use of items from tests done by other schools is a very important aspect in performance enhancement especially if there is coordination of setting between teachers of various schools. This may provide a fairly moderated set of test items and would widen the scope of the learners on various aspects of the content, which the teachers on their own could have overlooked.

Commercially produced papers and other sources are least used by teachers in both school categories. This may be attributed to the financial implications for their availability. Many school administrators may not be willing to purchase these sources
especially bearing in mind that teachers can as well do their setting and in addition these commercially produced papers tend to harbour mistakes. As much as this may be true, these sources are necessary in accessing the students to a variety of test items especially if the teachers proofread before testing.

Lesson observations indicated that teachers generally used class textbooks during supervised exercises and also in giving homework more than past K.C.S.E papers and personally constructed items. This may be due to lack of lesson plans, which implies that there is inadequate preparation by the teachers before their lessons. Adequate preparations would enable the teachers to select proper items of assessment in class from various sources. It was also further found that more teachers in good performing schools used past K.C.S.E papers in class exercises than those in poor performing schools. This indicates a likelihood of lesson preparation by these teachers. This disparity may influence performance of students in mathematics.

4.4 Frequency of assessment

Teachers were provided with a variety of techniques commonly used in assessment of mathematics learning and were required to indicate the frequency of use for each technique in assessing their students. The information, based on performance of schools is summarized and presented in table 4.5 for poor performing schools.
Table 4.5 Frequency of assessment methods used in poor performing schools

<table>
<thead>
<tr>
<th>Method</th>
<th>Daily</th>
<th>Weekly</th>
<th>Fortnightly</th>
<th>Monthly</th>
<th>Termly</th>
<th>Depending on topic</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>Written tests</td>
<td>1</td>
<td>5.9</td>
<td>5</td>
<td>29.4</td>
<td>0</td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>Practical work</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>11.8</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Project work</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>5.9</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Oral questions</td>
<td>10</td>
<td>58.8</td>
<td>4</td>
<td>23.4</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Home work</td>
<td>15</td>
<td>88.2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>5.9</td>
</tr>
<tr>
<td>Observation</td>
<td>7</td>
<td>41.2</td>
<td>2</td>
<td>11.8</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 4.5 shows that written tests and homework are the techniques used most (by 94.1% of the teachers). The most frequently used technique is homework with 88.2% of the sampled teachers using it daily. Though this should have had an impact on the performance of students, it has not been reflected. This implies that possibly this method is not effectively applied. The items used in the homework may not be exhaustively assessing the information learnt in the lesson. Also probably proper revision of the homework is not done to enhance understanding of the students.

Though most teachers used written tests in assessing their students, most of them used it monthly (52.9%) while only 35.3% (by adding weekly and daily percentages) used it
more frequently. Assessment using written tests done monthly may not be sufficient enough to diagnose students' weaknesses. There is need for written tests to be done more regularly to keep students on their toes throughout the term. This information can be compared with that in good performing schools as shown on table 4.6.

Table 4.6 Frequencies of assessment methods in good performing schools

<table>
<thead>
<tr>
<th>Method</th>
<th>Daily</th>
<th>Week-</th>
<th>Fortni-</th>
<th>Monthly</th>
<th>Term-</th>
<th>Depending on topic</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>Written tests</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>8.3</td>
<td>1</td>
<td>8.3</td>
<td>9</td>
</tr>
<tr>
<td>Practical work</td>
<td>2</td>
<td>16.7</td>
<td>1</td>
<td>8.3</td>
<td>2</td>
<td>16.7</td>
<td>1</td>
</tr>
<tr>
<td>Project work</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>16.7</td>
<td>1</td>
<td>8.3</td>
<td>1</td>
</tr>
<tr>
<td>Oral questions</td>
<td>8</td>
<td>66.7</td>
<td>2</td>
<td>16.7</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Home work</td>
<td>11</td>
<td>91.7</td>
<td>1</td>
<td>8.3</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Observation</td>
<td>8</td>
<td>66.7</td>
<td>2</td>
<td>16.7</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 4.6 shows that written tests, though used by all teachers in good performing schools are mostly used on monthly basis. The most frequently used assessment technique is homework with 91.7% of teachers using it daily. Also oral questions and observation of students are fairly frequently used both by 66.7% of the teachers daily. The least frequently used techniques are project and practical work, which are mainly
done depending on the topics taught in the term. Despite the fact that most teachers use all the methods of assessment, the frequencies are not sufficient. Written tests need to be done more often than is the case so as to assess all skills that the students are required to acquire.

From tables 4.5 and 4.6, it can be noted that the frequencies of using written tests, oral tests, home work and observation are similarly done by teachers in both poor and good performing schools. This indicates that the frequencies of these techniques do not significantly influence the performance of students in mathematics. This generalisation may not be true for all cases since most teachers did not assess their students as frequently as possibly.

4.5 Use of assessment data

4.5.1 Need for assessment

Teachers' reasons for assessing their students were looked at as a way of determining the use they put the assessment data into. Teachers of mathematics in the sample were therefore asked to give reasons for assessing their students on a five point Likert scale. The mean scores for every reason were calculated. A score below three (3) was viewed as an indication of disagreement with the stated reason while a score above three (3) was viewed as an agreement with the same reason. A score of three (3) was therefore viewed as neither agreeing nor disagreeing with the given reason. The scores were grouped according to the performance of the students in their schools; poor performing and good performing. This summary and the overall score from all sampled teachers are given in table 4.7.
Table 4.7 Mean scores for teacher’s reasons of assessment

<table>
<thead>
<tr>
<th>Reasons for assessment</th>
<th>Poor performing schools</th>
<th></th>
<th>Good performing schools</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean score</td>
<td>Preference rating</td>
<td>Mean score</td>
<td>Preference rating</td>
</tr>
<tr>
<td>To determine which student needs individual attention</td>
<td>4.20</td>
<td>4</td>
<td>4.33</td>
<td>5</td>
</tr>
<tr>
<td>As part of teaching and learning</td>
<td>4.71</td>
<td>1</td>
<td>4.42</td>
<td>2</td>
</tr>
<tr>
<td>To judge teaching effectiveness</td>
<td>3.88</td>
<td>6</td>
<td>4.42</td>
<td>2</td>
</tr>
<tr>
<td>To find out students’ mastery of content</td>
<td>4.44</td>
<td>2</td>
<td>4.50</td>
<td>1</td>
</tr>
<tr>
<td>To prepare students for external examinations</td>
<td>4.22</td>
<td>3</td>
<td>4.08</td>
<td>7</td>
</tr>
<tr>
<td>To grade the students</td>
<td>3.39</td>
<td>9</td>
<td>3.92</td>
<td>8</td>
</tr>
<tr>
<td>To encourage the students to learn</td>
<td>3.71</td>
<td>7</td>
<td>4.25</td>
<td>6</td>
</tr>
<tr>
<td>To predict the courses that students will take in future</td>
<td>3.0</td>
<td>10</td>
<td>3.83</td>
<td>9</td>
</tr>
<tr>
<td>To find out students’ mastery of skills</td>
<td>4.19</td>
<td>5</td>
<td>4.42</td>
<td>2</td>
</tr>
<tr>
<td>To determine the learners readiness for a topic</td>
<td>3.65</td>
<td>8</td>
<td>3.36</td>
<td>10</td>
</tr>
</tbody>
</table>

In both poor and good performing schools, the teachers’ reasons for assessing their students are similar. What differs is the preference given to various reasons.

Teachers in poor performing schools have most preferred reason for assessment as being part of teaching and learning. They however do not agree nor disagree with assessment for predicting the courses that students will take in future. On the other hand, teachers in good performing schools agree with all the reasons given with assessment being done to find out students’ mastery of content as the most preferred. The purpose of determining learners’ readiness for a topic is the least preferred reason by the teachers. This implies
that poor performing schools mainly take assessment as a teaching routine as compared to their counterparts in good performing schools. This depicts the stress put by assessment on each category of schools and shows that teachers in poor performing schools do not give assessment the adequate emphasis it deserves.

Similarly, besides assessing their students for various reasons, teachers in good performing schools also assess to predict the courses their students will take in future whereas teachers in poor performing schools do not. This emphasizes the concern that teachers have for their students even after formal schooling. Such concern translates to the need to shape up their students' abilities in order to better the courses that they will undertake hence improve in their performance. Thus there is need for teachers to have concern for their students if the students are to perform well. This may be achieved by realising the fundamental reasons of assessment.

The reasons for assessment can further be looked at by grouping them into three categories depending on when the assessment is done, that is, before, during or after the instructional process. Table 4.8 gives the mean scores and percentages for reasons for assessing students based on when the assessment was done are given.
### Table 4.8 Teachers’ reasons based on the time of assessment

<table>
<thead>
<tr>
<th>Time of assessment</th>
<th>Poor performing schools</th>
<th>Good performing schools</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean score</td>
<td>Preference rating</td>
</tr>
<tr>
<td>Assessment before the instructional process (diagnostic)</td>
<td>3.00</td>
<td>3</td>
</tr>
<tr>
<td>Assessment during the instructional process (formative)</td>
<td>4.21</td>
<td>1</td>
</tr>
<tr>
<td>Assessment after the instructional process (summative)</td>
<td>4.02</td>
<td>2</td>
</tr>
</tbody>
</table>

The results generally show that teachers assessed their students in all categories but the least preferred is that of assessing before the instructional process. Teachers in good performing schools prefer to assess their students in all the three categories compared to those in poor performing schools. Though assessment before instructional process is least preferred, teachers in good performing schools (3.60) do it unlike their counter parts in poor performing schools (3.00). This implies that teachers in poor performing schools do not consider much of the importance of prior learning. This may be due to the fact that teachers in poor performing schools sometimes have an attitude of their students being below average in their mathematical abilities. This fact, if true, is regrettable and does not underscore the importance of assessment before instructional process. Pre-test is necessary in determining what the learner brings to class and the teacher is responsible in shaping this already perceived knowledge of the learner to suit the true facts of mathematics.
Further analysis of teachers’ reasons of assessment based on the time in which the assessment was done using One-way Anova method of analysis is shown in table 4.9.

Table 4.9 One-way ANOVA results on teachers’ reasons based on time of assessment

<table>
<thead>
<tr>
<th></th>
<th>Sum of square</th>
<th>df</th>
<th>Mean square</th>
<th>F</th>
<th>Sig. level (p)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DIAGNOSTIC ASSESSMENT</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between Groups</td>
<td>32.576</td>
<td>1</td>
<td>32.576</td>
<td>9.998</td>
<td>0.04</td>
</tr>
<tr>
<td>Within Groups</td>
<td>87.975</td>
<td>27</td>
<td>3.256</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>120.552</td>
<td>28</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FORMATIVE ASSESSMENT</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between Groups</td>
<td>15.724</td>
<td>1</td>
<td>15.724</td>
<td>8.319</td>
<td>0.08</td>
</tr>
<tr>
<td>Within Groups</td>
<td>51.034</td>
<td>27</td>
<td>1.890</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>66.759</td>
<td>28</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SUMMATIVE ASSESSMENT</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between Groups</td>
<td>85.931</td>
<td>1</td>
<td>85.931</td>
<td>10.497</td>
<td>0.03</td>
</tr>
<tr>
<td>Within groups</td>
<td>221.034</td>
<td>27</td>
<td>8.186</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>306.966</td>
<td>28</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4.9 shows level of significance and the F distribution value of each of the three time-based categories of assessment. In two of the three categories, the level of significance is less than 0.05 (p < 0.05). This indicates that at $\alpha = 0.05$ there is a significant difference in the reasons based on time of assessment between teachers in poor and good performing schools. This therefore implies that time for assessment can affect the learning achievement of the learners. All the three times of assessment
especially before instructional process (diagnostic) are important and need to be emphasized in schools.

4.5.2 Assessment records

Uses of assessment data can also be determined by the way teachers handle the assessment information. Teachers were asked to state the assessment techniques for which they kept records for their students’ progress. Table 4.10 summarizes their responses.

4.10 Assessment records from various techniques

<table>
<thead>
<tr>
<th>Technique</th>
<th>Poor performing schools (N = 17)</th>
<th>Good performing schools (N = 12)</th>
<th>Total (N = 29)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of teachers</td>
<td>%</td>
<td>No. of teachers</td>
</tr>
<tr>
<td>Written tests</td>
<td>15</td>
<td>88.2</td>
<td>12</td>
</tr>
<tr>
<td>Project work</td>
<td>3</td>
<td>17.6</td>
<td>1</td>
</tr>
<tr>
<td>Practical work</td>
<td>1</td>
<td>5.9</td>
<td>3</td>
</tr>
<tr>
<td>Home work</td>
<td>1</td>
<td>5.9</td>
<td>1</td>
</tr>
<tr>
<td>Oral questions</td>
<td>1</td>
<td>5.9</td>
<td>2</td>
</tr>
<tr>
<td>Observation</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 4.10 gives the numbers and percentages of teachers who kept assessment records for their corresponding techniques of assessment. The results are grouped according to performance of the schools and the overall results.

It can be identified that for the most frequently used methods of assessment (home work, oral questions and observation) as shown in table 4.5 and 4.6, assessment records were
rarely kept. On the other hand, most teachers kept their records for written tests which were done monthly. The lack of records for the techniques frequently done such as homework, oral tests and observation of students can be attributed to their being used mainly to facilitate instruction. The teachers may have felt that this did not require record keeping since it was formative assessment. This should not be the case since every assessment technique should have a purpose and therefore requires recording of the results so as to help accomplish the purpose. Written tests are recorded since it is a requirement in most schools as a policy. This is mainly due to the fact that these records are normally forming part of the term examination records.

The teachers also rarely recorded project work and practical work. This may also be attributed to the fact that teachers take them as informal evaluation approaches. More so, the structure of our examination system does not emphasize for their use, and hence teachers may only use them to develop a wider scope of their students’ mathematical learning beyond formal examinations. There is need therefore, for teachers to be sensitized on the need to keep these records. This can be achieved if the schools, through the Ministry of Education and Human Resource Development make clear policies on keeping of these records.

Assessment information can further be obtained from the procedures used by teachers of mathematics to analyse the assessment results of their students. This was done by examining their assessment records. The information is summarized in table 4.11.
### 4.11 Records on various analysis procedures used in test results

<table>
<thead>
<tr>
<th>Records on analysis procedures for students’ performance.</th>
<th>Poor performing schools (N=17)</th>
<th>Good performing schools (N=12)</th>
<th>Overall (N = 29)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of teachers</td>
<td>%</td>
<td>No. of teachers</td>
</tr>
<tr>
<td>Individual raw marks</td>
<td>16</td>
<td>94.1</td>
<td>10</td>
</tr>
<tr>
<td>Individual percentage marks</td>
<td>7</td>
<td>41.2</td>
<td>6</td>
</tr>
<tr>
<td>Mean raw marks</td>
<td>7</td>
<td>41.2</td>
<td>6</td>
</tr>
<tr>
<td>Mean percentage marks</td>
<td>5</td>
<td>29.4</td>
<td>5</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>1</td>
<td>5.9</td>
<td>0</td>
</tr>
<tr>
<td>Grading</td>
<td>3</td>
<td>17.6</td>
<td>3</td>
</tr>
<tr>
<td>Ranking</td>
<td>2</td>
<td>11.8</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 4.11 shows the statistical procedures recorded by teachers in analysing the performance of their students in the assessment tests with some teachers recording more than one procedure. It can generally be noted that most teachers record the individual raw marks of their students only as a way of statistical analysis. Converting individual raw marks into percentages, finding the means of both raw marks and percentages were not done by most of the sampled teachers as shown by 44.8%, 44.8%, and 37.9% respectively. The other procedures of using standard deviation, grading and ranking were rarely used. All the other statistical procedures besides individual raw data are necessary for effective interpretation of students’ assessment results. The high percentage of teachers recording individual raw marks and lower percentages on the other procedures may imply that most teachers are not interested in the interpretation of their students’ results which in turn suggests a likelihood of not using the results to assist their students.
Presenting assessment results in percentages, finding the means as well as standard deviation; ranking and grading are useful procedures in enhancing teacher’s understanding of their students’ abilities. This is likely to influence the teacher to initiate ways of improving the results by possibly discussing the results with the students and having remedial lessons among others.

It can further be noted from table 4.11 that a higher proportion of the teachers in good performing schools recorded the other procedures besides the individual raw marks as compared to those in poor performing schools. Though these percentages are not sufficient, they show that these teachers are likely to have some more commitment in the use of assessment results to assist students to improve their performance such as comparing past performance and advising the students on their performance trends more accurately. There is therefore need for teachers to record their students’ assessment results using more of the other procedures other than individual raw marks only for better interpretation of the results.

Further analysis of records can be seen in the frequency with which teachers make remarks on their students’ progress in their assessment results. These remarks are meant to motivate the students to work hard so as to improve their performance. Teachers were asked as well as documents such as students’ exercise books, test answer sheets and mark books checked to find out how often they make comments/remarks on their students’ progress. Table 4.12 shows the results of this exercise.
4.12 Frequency of remarks made by teachers on students’ progress

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Poor performing Schools (N = 17)</th>
<th>Good performing Schools (N = 12)</th>
<th>Overall (N = 29)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>Often</td>
<td>1</td>
<td>5.9</td>
<td>3</td>
</tr>
<tr>
<td>Sometimes</td>
<td>12</td>
<td>70.6</td>
<td>6</td>
</tr>
<tr>
<td>Never</td>
<td>4</td>
<td>23.5</td>
<td>3</td>
</tr>
<tr>
<td>TOTAL</td>
<td>17</td>
<td>100</td>
<td>12</td>
</tr>
</tbody>
</table>

Table 4.12 shows the frequency of teachers in making remarks. The results generally show that very few teachers often make remarks on their students’ progress while most of them sometimes make the remarks and a few teachers never make any remarks at all. This may imply that most teachers do not understand the value of making remarks on students’ achievement. Though remarks may have either negative or positive influence on the students performance, detailed analysis on this is beyond the scope of this study. The researcher assumed that remarks made by teachers do motivate their students. Similarly, the fact that most teachers sometimes make remarks is not sufficient to lead to motivation. It indicates that they irregularly make the remarks hence this may not be internalized by the students to encourage them to work harder. There is therefore need for teachers to more often than not make remarks on their students’ progress.

It can further be noted that despite the few numbers of teachers often making remarks on their students’ progress, most of them (25%) are in the good performing schools. Though this percentage is not sufficient, it may be seen as a significant factor in influencing
performance of students since remarks on students’ progress signify a commitment to improve their achievements.

Assessment records were further looked at in line with the frequencies in which teachers set or encourage their students to set targets of achievement. The understanding that setting of score targets with the students may bring the awareness of their potential and hence stimulate them to put more effort in their work necessitated this. This was done by checking the assessment records on the score targets from the sampled teachers. The results are summarized in table 4.13

Table 4.13 Frequencies for records of score targets set by teachers of mathematics

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Poor performing schools (N = 17)</th>
<th>Good performing schools (N = 12)</th>
<th>Overall (N = 29)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of teachers</td>
<td>%</td>
<td>No. of teachers</td>
</tr>
<tr>
<td>Often</td>
<td>6</td>
<td>35.3</td>
<td>7</td>
</tr>
<tr>
<td>Sometimes</td>
<td>2</td>
<td>11.8</td>
<td>2</td>
</tr>
<tr>
<td>Never</td>
<td>9</td>
<td>52.9</td>
<td>3</td>
</tr>
<tr>
<td>TOTAL</td>
<td>17</td>
<td>100</td>
<td>12</td>
</tr>
</tbody>
</table>

Table 4.13 shows the frequency in which teachers set targets for their students or facilitate target setting by their students. It can be noted that less than half of the sampled teachers (44.8%) are often involved in setting targets with their students. Only 13.8% of them are sometimes involved in target setting while 41.4% never do that. These signify that there is a likelihood of either most teachers do not understand the importance of setting score targets for their students or there is a general laxity by teachers. In either
case, there is need for policies to be put in place in schools and enforced so as to ensure that most teachers often set score targets with their students.

On the other hand, despite few teachers often involving themselves in setting score targets, majority of these teachers are in good performing schools. Also more teachers in the poor performing schools never involve themselves in target setting compared to those in good performing schools. This implies that teachers in good performing schools have knowledge of their students' individual abilities. It is this knowledge that the teacher can use to advice the student on the level of target to be achieved and hence encourage the student to improve in performance. This therefore indicates that setting of score target has an influence in the performance of students.

4.5.3 Assessment diagnostic aspects

The issue of marking assessment tests was of concern to the researcher. It was seen as a way, which a teacher can use to enhance mathematical ability of their students. All teachers sampled for the study responded that it was the duty of the subject teacher to mark the tests. Issues were further raised to the teachers on the aspects of diagnosis they looked for while marking the assessment tests and table 4.14 shows their responses.
Table 4.14 Aspects looked for while marking tests

<table>
<thead>
<tr>
<th>Aspects of diagnosis</th>
<th>Poor performing schools (N = 17)</th>
<th>Good performing schools (N = 12)</th>
<th>Overall (N = 29)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of teachers %</td>
<td>No. of teachers %</td>
<td>No. of teachers %</td>
</tr>
<tr>
<td>No aspect</td>
<td>2 11.8</td>
<td>0 0</td>
<td>2 6.9</td>
</tr>
<tr>
<td>Pattern of errors</td>
<td>12 70.6</td>
<td>11 91.7</td>
<td>23 79.3</td>
</tr>
<tr>
<td>Unfinished items</td>
<td>9 52.9</td>
<td>10 83.3</td>
<td>19 65.5</td>
</tr>
<tr>
<td>Items not attempted</td>
<td>12 70.6</td>
<td>12 100</td>
<td>24 82.8</td>
</tr>
<tr>
<td>Pattern of responses</td>
<td>10 58.8</td>
<td>10 83.3</td>
<td>20 69.0</td>
</tr>
</tbody>
</table>

Table 4.14 gives the numbers and percentages of the teachers who account for various aspects of diagnosis of their students while marking the assessment tests. It can generally be noted generally from the table that only a few teachers do not look for any aspect. Most teachers looked for pattern of errors (79.3%), and items not attempted (82.8%). A good number of teachers also looked for unfinished items (65.5%), and patterns of responses (69.0%). This implies that most teachers probably understand the need to diagnose the students’ way of answering the assessment questions. This diagnosis is important in evaluating students’ abilities in answering questions and hence may enable the teacher to assist the students more so as to answer questions exhaustively and accurately. There is therefore need for more teachers to look for these aspects so as better their students’ performance.

Despite the fact that generally teachers look for most of the aspects of diagnosis, there are certain specific aspects that are emphasized differently among teachers in the poor and
good performing schools. These include unfinished items, pattern of responses and general average performance. Teachers in good performing schools emphasized these aspects more than their counterparts in poor performing schools. The differences in emphasis on certain aspects imply that there may be differences in levels of concern by teachers in ensuring that their students acquire the necessary knowledge and skills in mathematics. This in turn influences the performance of their students.

The study also revealed that more teachers in good performing schools account for all aspects compared to those in poor performing schools. This implies that proper consideration of the aspects of diagnosis while marking students' assessment tests contribute significantly to performance in mathematics. This is because, identification of the aspects will increase the teachers’ realisation of the students’ weaknesses and hence emphasize on those areas.

4.6 Aspects of learning assessed

The level of questions that teachers of mathematics used in assessing their students was examined. Three levels of questions namely: knowledge; application and understanding were identified. The results were obtained after examining all question items in the teachers’ assessment tests. All items assessing a given aspect of mathematics learning were noted for each aspect. The information is summarized in table 4.15.
Table 4.15 Cognitive aspects of learning assessed by teachers of mathematics

<table>
<thead>
<tr>
<th>Cognitive aspects of mathematics learning tested</th>
<th>Poor performing schools</th>
<th>Good performing schools</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of test items</td>
<td>%</td>
</tr>
<tr>
<td>Knowledge and facts</td>
<td>48</td>
<td>7</td>
</tr>
<tr>
<td>Understanding</td>
<td>404</td>
<td>58.5</td>
</tr>
<tr>
<td>Application</td>
<td>238</td>
<td>34.5</td>
</tr>
<tr>
<td>TOTAL</td>
<td>N = 690</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 4.15 shows the number and percentages of the items testing any given aspect of mathematics learning in both poor and good performing schools. The results indicate that the teachers in poor performing schools’ distribution centered their question items around assessment of learners’ understanding (58.5%) and less on the other aspects. Since all the other levels of testing for secondary school students are equally important, emphasis on one level is likely to discourage the students hence lead to poor performance. On the other hand, teachers in good performing schools distributed their question items in the three levels more fairly than those of poor performing schools. This may motivate the students since it assesses questions of varying degrees of difficulty. These differences in distribution of questions among the aspects of mathematics learning significantly influence performance of students.

There is therefore need for a balanced distribution of questions among all the aspects of learning mathematics in secondary school levels. The variation in the distribution may also be attributed to lack of use of the specification table while setting the tests. The
researcher sought to find out whether teachers of mathematics prepare and use tables of specification. The findings are shown on table 4.16.

**Table 4.16 Frequency of teachers' preparation of a table of specification**

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Poor performing schools (N = 17)</th>
<th>Good performing schools (N = 12)</th>
<th>Overall (N = 29)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of teachers</td>
<td>%</td>
<td>No. of teachers</td>
</tr>
<tr>
<td>Often</td>
<td>8</td>
<td>47.06</td>
<td>5</td>
</tr>
<tr>
<td>Sometimes</td>
<td>7</td>
<td>41.18</td>
<td>6</td>
</tr>
<tr>
<td>Never</td>
<td>2</td>
<td>11.76</td>
<td>1</td>
</tr>
<tr>
<td>TOTAL</td>
<td>17</td>
<td>100</td>
<td>12</td>
</tr>
</tbody>
</table>

Table 4.16 shows the frequency in which teachers of mathematics use tables of specification to facilitate their test construction. The results indicate that only 44.83% of the teachers sampled often use the table of specification, 44.83% sometimes do while 10.3% never use the table at all in constructing their assessment tests. This suggests that most of the sampled teachers know about the table of specification inspite of not fully using it. This may be due to lack of emphasis put about the use of tables of specification. There is therefore a need for schools to enforce the use of tables of specication by teachers while constructing their students’ tests.

The results in table 4.16 further show that 47.1% of the teachers in poor performing schools do use the table of specification often while 41.7% of those in good performing schools often use it. Also 41.18% and 50% of teachers in poor and good performing
schools respectively, sometimes prepare the table of specification. This indicates similarity in the use of the specification table and hence does not suggest any significant influence on the performance of the students. Though this may be the case, there is need to emphasize on the use of the table of specification so as to enable a fair distribution of question items to all domains which in turn influences performance.

4.7 Chapter summary

This chapter has presented the data, analysed them and discussed the findings. It was generally found that some assessment variables were more influential on the performance of students in mathematics than others. The more fundamental ones include the following:

a) The time of assessment, and more so, assessment before instructional process (diagnostic) was influential and need to be emphasized.

b) Consideration of individual differences in assessment especially the most frequently (daily) assessment techniques is of significance.

c) The selection of the sources of items for assessment as well as the consideration of all techniques of assessment such as practical work and project work is also important.

d) It was also found out that record keeping of assessment results, their analysis procedures, remarks on students' progress and target setting were influential factor.

e) The aspects of diagnostic analysis of performance accounted for during assessment such as pattern of errors, unfinished items, unattempted items, pattern
of responses and general average performance of students are important contributors to performance.

f) The levels of domains in mathematics learning in the question items and the proportion of the content covered that is tested were found to be important.

The summary of the findings and the recommendations arising from it are given in the next chapter.
CHAPTER FIVE
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter gives a summary of the findings after which conclusion, recommendations and suggestions for further additional research are made.

5.1 Summary of the research findings

a) Modes of assessment

i) It was found out that most teachers generally assess their students during the lesson. It was further found out that there was a weak correlation between assessment procedures during the lesson and performance of students in mathematics. More so, teachers who cared for individual differences in their assessment had their students performing better.

ii) Most teachers assessed their students using various testing techniques. Though there was seen to be no significant influence between the uses of some techniques (written tests, oral tests and homework) on performance of students, it was found out that students whose teachers also used practical work and project work performed better than those who did not.

iii) Teachers generally looked for most aspects of diagnostic analysis of performance while marking assessment test. It was further found out that the aspects of diagnostic analysis of performance that were examined significantly influenced performance of students in mathematics. The schools whose teachers properly examined all aspects performed better than those that did not.
b) Content coverage in assessment

i) Teachers generally used similar sources of items in their assessment tests. Specific emphasis on some sources such as previously done tests and tests from other schools were influential. Students whose assessment items were mainly from tests done in other schools performed better than those whose items were mainly from previously done tests.

ii) It was found out that teachers mostly tested between 21 – 40 % of the content they have taught in a term. The proportion of content taught that is assessed showed some influence in the performance of the students. Students whose assessment covered most of the content taught performed better.

c) Uses of assessment data

i) Teachers’ reasons of assessing their students were seen to be similar with differences only in the preferences given to various reasons. It was realised that those reasons based on time of assessment had a significant influence. Teachers who put more emphasis on assessment before, during, and after, instructional process lead to better results of their students.

ii) Most teachers recorded the individual raw marks of their students without analysing the performance. It was found out that teachers who apply more methods of analysis of their students’ assessment results had better results of their students.

iii) Very few teachers often make remarks on their students’ progress after assessment while most of them sometimes make the remarks. It was further noted that teachers who often make remarks on their students’ progress produce better results.
iv) A few teachers often are involved in target setting on their students’ performance. It was realised that teachers who are often involved in target setting of their students’ performance influence the students’ results.

d) Frequency of assessment
The most frequently used techniques of assessment were found to be homework, oral questioning and observation of students. These were done daily while the other techniques were mainly done either monthly (written tests) or depended on topics taught (practical and project works). It was further found out that the frequency of assessment did not affect the performance of the students.

e) Aspects of learning assessed
i) It was found out that teachers assess their students in all domains of learning but differ only on the emphasis on certain domains. The distribution of assessment items in all domains of learning was seen to influence the performance of the students in mathematics. Teachers who fairly and evenly distributed their assessment items in all domains were seen to have their students perform better than those who did not.

ii) It was generally realized that most teachers did not often prepare tables of specification to facilitate their test construction. This was not seen to have an influence in performance since similar proportions of teacher in both poor and good performing schools did not prepare the table of specification.
5.2 Conclusion

From the summary of the findings given in section 5.1, it can be seen that the modes of assessment by teachers, the proportion of work taught by the teacher that is assessed, the teacher’s use of the assessment results of their students and the levels of cognitive development in the assessment items by teachers influence the performance of students in mathematics.

This therefore shows that teachers’ assessment practice enhances students’ performance in mathematics. Unless these assessment practice are incorporated in the teaching of mathematics the performance of students may continue to be poor.

5.3 Recommendations of the study

1. Since the modes of assessment by teachers influence the performance of students in mathematics, consideration of individual differences during lesson assessment is necessary. There is also need for teachers to assess their students using all techniques including practical and project works. Similarly all aspects of diagnostic analysis of performance need to be emphasized while marking assessment tests. This could be done through seminars and workshops to educate teachers on marking procedures in line with those of the Kenya National Examination Council.

2. The proportion of content taught by the teacher that is assessed should be improved such that most of the works covered are assessed. It is suggested that teachers should list down all knowledge and skills covered in the term and regularly give assessment tests to ensure all the listed items are adequately assessed.
3. The teacher’s use of assessment results was found to influence performance of students in mathematics. It is suggested that schools should make policies on record keeping of various assessment issues such as results analysis, remarks on individual student’s progress and targets set with a view to advising students to better their performance in mathematics.

4. The levels of cognitive development in the assessment items were seen to vary among teachers. It is suggested that teachers should evenly distribute their assessment items to all domains of learning. This can be done by use of a table of specification during test construction.

There is generally a need for a national policy that will govern assessment practice in schools. Such a policy should address all aspects of assessment. This will make assessment practice in general and mathematics teaching in particular uniform and hence may lead to the Kenya National Examination Council to consider using teachers’ records of students’ performance in determining final grading of students.

5.4 Suggestions for further research

1. The study focused on the existing situation as relates to assessment practice in mathematics in Kenyan secondary schools. It considered the methods used, frequency, levels of testing, proportion of content coverage and the teacher’s use of assessment data. The results of the study do not describe the nature of the tests items in terms of their reliability and validity. If the assessment results from the schools are to be compared with
the national examination results, there is need to carry out a study on teacher assessment tests with the aim of establishing their reliability and validity.

2. The study was basically limited in scope in the sense that the sample respondents were drawn from selected teachers in Mombasa district schools of coast province. The results found may mainly reflect the situation in the district, hence may not be representative of all secondary schools in Kenya. Thus, this study needs to be replicated in other districts in order to give a reflection of the whole country. This will facilitate better decision-making on ways of improving teachers’ assessment practice for enhancing students’ performance in mathematics in Kenya.
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Compare 15 (2), 14 – 151.

Brace and World Inc.


APPENDICES

APPENDIX A: MATHEMATICS TEACHERS’ QUESTIONNAIRE

(To be completed by teachers of mathematics currently teaching forms three).

The purpose of this questionnaire is to find out the assessment procedures used by practicing teachers of mathematics in Mombasa district. You are kindly requested to fill this questionnaire with honesty and individuality. This will greatly contribute to my goal and may go along way in improving the assessment practice in Kenya. You are expected to respond to all questions by either ticking or writing an explanation where necessary in the spaces provided. You are guaranteed that your responses will be treated with confidence and used only for its intended purpose. You need not write your name anywhere in this questionnaire.

Section A: General information about the teacher and the school.

1. Name of school ________________

2. Type of school  Boys [ ] Girls [ ] Mixed [ ]

3. Marital status  M/M [ ] S/M [ ] M/F [ ] S/F [ ]

4. Highest academic qualification: Non graduate [ ] Graduate [ ]
   Any other specify ________________

5. Highest professional qualification: P1 [ ] S1 [ ] Dip. Ed [ ] B. Ed. [ ]
   Any other specify ________________

6. Teaching experience in years: Less than 2[ ] 2 – 5 [ ] 6 – 10 [ ] 11 – 20 [ ]
   Over 20 [ ]
7. Have you had a chance to attend the following programmes in the past that deal with assessment in mathematics? a) Seminars [ ] b) workshops [ ] c) comparative exams [ ] d) none [ ]

Section B: General assessment information.

The statements below, from no.1 to 10, are possible reasons for assessing your students. Show by indicating against each statement that you either Strongly Disagree (SD); Disagree (D); Unsure (U); Agree (A) or Strongly Agree (SA).

1. To determine who needs individual attention.

2. For continuous assessment as part of teaching and learning

3. To judge teaching effectiveness

4. To find out pupils mastery of content

5. To prepare students for external examinations

6. To grade the students

7. To encourage the students to learn

8. To predict the courses that students will take

9. To find out pupil’s mastery of skills

10. To determine learners’ readiness for a topic
The statements below, from no. 11 to 15, show how teachers assess their students. Indicate against each statement basing on how you assess your students either Usually (U); Sometimes (S) or Never (N).

11. All my students do exercises from the class textbook during each lesson
12. All my students are given the same work during each lesson
13. I mark all exercises done by my students
14. I give extra lessons to weaker students
15. I give challenging questions to brighter students

16. Rate all the following sources of items in your major mathematics tests, giving one (1) point to the least used and eight (8) points to the most used source.

<table>
<thead>
<tr>
<th>Source</th>
<th>Point rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>New items personally constructed</td>
<td></td>
</tr>
<tr>
<td>Previous tests</td>
<td></td>
</tr>
<tr>
<td>Tests from other schools</td>
<td></td>
</tr>
<tr>
<td>Textbooks</td>
<td></td>
</tr>
<tr>
<td>Past KCSE papers</td>
<td></td>
</tr>
<tr>
<td>Commercially produced papers</td>
<td></td>
</tr>
<tr>
<td>Other teachers in the department</td>
<td></td>
</tr>
<tr>
<td>Others (specify)</td>
<td></td>
</tr>
</tbody>
</table>
17. The table below shows various assessment techniques used by mathematics teachers. Please indicate against each one of the frequency to which you use to assess your Students.

<table>
<thead>
<tr>
<th>Techniques</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Daily</td>
</tr>
<tr>
<td>Written</td>
<td></td>
</tr>
<tr>
<td>Use of practical work</td>
<td></td>
</tr>
<tr>
<td>Project work</td>
<td></td>
</tr>
<tr>
<td>Oral tests</td>
<td></td>
</tr>
<tr>
<td>Homework</td>
<td></td>
</tr>
<tr>
<td>Observation</td>
<td></td>
</tr>
</tbody>
</table>

18. Which of the above techniques’ results do you include in your mark book?

1 ____________________________ 2 _________________________

3 ____________________________ 4 _________________________

5 ____________________________ 6 _________________________

19. The items below are the major aspects of diagnostic analysis of performance; indicate against each that you account for in marking mathematics test.

i) No aspect accounted for [ ]

ii) Pattern of errors [ ]

iii) Unfinished items [ ]

iv) Items not attempted [ ]

v) Patterns of responses [ ]

vi) Any other specify ____________________________
20. The items below are records of statistical analysis of performance techniques, indicate against each that you use in a single mathematics test for your class.
   i) Individual raw marks
   ii) Individual percentage marks
   iii) Mean raw marks
   iv) Mean percentage marks
   v) Skewness
   vi) Others specify

21. What additional aspect of analysis do you use for a set of tests? Specify

22. How often do you use a blue print or a specification grid to facilitate your test construction?

Thank you for co-operation.
APPENDIX B: LESSON OBSERVATION SCHEDULE

(To be filled by the researcher while observing the lesson proceedings)

The purpose of this instrument was to find out how mathematics teachers assessed their students during mathematics lessons.

General information about the teacher and the school

Date ___________________________ School ___________________________

Class __________________________ no. of students _______________________

1. Teacher’s academic qualification

2. Teacher’s professional qualification.

3. Teaching experience __________________________

4. Teacher’s gender __________________________

   C

   M

Professional observation

5. Are pupils given homework? __________________________
6. Type of questions for homework.

- Project
- Structured
- Long

7. Source of questions for homework

- Teacher-made
- Textbook
- Past examination papers
- Any other specify

8. Does the teacher mark students' work during the supervised practice?

9. Does the teacher revise with pupils after the homework has been done?

10. Does the teacher ask oral questions at the beginning of the lesson to determine learners' readiness for the lesson?
11. Which of the following educational domains tested in the homework given?

Cognitive
Psychomotor
Affective
Social

12. Any other classroom observation made (specify) ____________________________

______________________________
APPENDIX C: DOCUMENT ANALYSIS SHEET

The purpose of this instrument was to extract more information relating to mathematics assessment records and content of the test items. The researcher looked into the necessary documents available from the teachers of mathematics including schemes of work, mark books, test papers marking schemes and students’ exercise books.

**General information about the teacher and the school**

Date_________________________ School_________________________

Class________________________ No. of students____________________

1. Teacher’s academic qualification____________________________________

2. Teacher’s professional qualification___________________________________

3. Teaching experience_________________________________________________

4. Teacher’s gender____________________________________________________

**Assessment information**

5. Frequency of tests

Weekly
Monthly

Any other specify

6. Mode of administration of the tests

Fixed time

Open-ended

Project

7. Cognitive aspects of mathematics learning in the tests

Knowledge and fact

Understanding

Application

8. Test records

a) Raw marks: maximum marks

   Individual marks

   Mean (per test)

   Mean (all tests)

b) Percentage marks: Individual

   Mean (per test)

   Mean (all tests)

c) Standard deviation: Each test

   For totals
d) Ranks: Each tests
   For totals

e) Grade: Individual
   Mean (per test)
   Mean (all tests)

9. Remarks of teachers: For individual student
   For group

10. Targets setting and the degree of attainment records
    a) By students
    b) By the teacher

11. Marking of the homework.
    Often
    Sometimes
    Never
APPENDIX D: LIST OF THE SECONDARY SCHOOLS IN MOMBASA DISTRICT

1. Al – Madrasatus Academy *
2. Allidina Visram High*
3. Memon High
4. Aga Khan Kenya Secondary*
5. Mama Ngina Girls*
6. Aga Khan High
7. Sheikh Khalifa Bin Zayed
8. Shimo – La - Tewa High
9. Khamis High
10. Dar – Ul – Ulum*
11. Star of the Sea Girls
12. Mombasa Secondary school for the Physically Handicapped
13. Changamwe Secondary
14. Tudor Day Secondary
15. Sacred Heart High
16. Coast Girls High
17. St. Charles Lwanga
18. Qubaa Academy
19. Shariff Nassir Girls
20. Mombasa Baptist High*
21. Likoni Secondary
22. Mombasa High
23. Burhaniya Academy
24. Serani Secondary*
25. Makupa High
26. Iyale Academy
27. St. Teresas Girls*
28. Mombasa Secondary
29. Kilindini Secondary

* Schools sampled for lesson observation