ENGLISH LANGUAGE COMPETENCE AND MATHEMATICS PERFORMANCE AMONG SECONDARY SCHOOL STUDENTS IN BUNGOMA EAST SUB-COUNTY, BUNGOMA COUNTY, KENYA.

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E55/CE/15404/2008

A RESEARCH THESIS SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF EDUCATION IN THE SCHOOL OF EDUCATION OF KENYATTA UNIVERSITY.

SEPTEMBER, 2015
DECLARATION

I confirm that this research thesis is my original work and has not been presented in any other university/institution for certification. The thesis has been complemented by referenced works duly acknowledged. Where text, data, graphics, pictures or tables have been borrowed from other works—including the internet, the sources are specifically accredited through referencing in accordance with anti-plagiarism regulations.

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DEDICATION

To my parents, J.Wafula and P.Wafula; my wife, Dorice and children; Enock, Abigail and Emmanuel.
ACKNOWLEDGEMENT

First and foremost, I would like to thank my supervisors; Dr. M. Miheso and Dr. D. Muindi for their invaluable criticism which made this study come to reality. Many thanks go to the staff in the department of Educational Communication and Technology. In particular, I thank Prof. H. Ayot, Dr. S. Rukangu, Dr. V. Kimui, Dr. D. Khatete, Dr. E. Gitau (R.I.P) and Dr. S. Ondigi for having given me the foundation in pursuit of a Master degree. My gratitude is also extended to my classmates for their encouragement while pursuing my studies. Prof. John Maundu and Mr. Antony D. Bojana deserve gratitude for their editorial contribution.

I am heavily indebted to my family members and friends for their moral and financial support. Finally but not least, I thank Kenyatta University for accepting me as one of the students and giving me a conducive atmosphere so that I can achieve my dream in life.
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<th>Definition</th>
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<tbody>
<tr>
<td>ANOVA</td>
<td>Analysis of Variance</td>
</tr>
<tr>
<td>B.Ed</td>
<td>Bachelor Of Education</td>
</tr>
<tr>
<td>CVI</td>
<td>Content Validity Index</td>
</tr>
<tr>
<td>Dip. Ed</td>
<td>Diploma in Education</td>
</tr>
<tr>
<td>M.Ed</td>
<td>Master of Education</td>
</tr>
<tr>
<td>ICT</td>
<td>Information Communication Technology</td>
</tr>
<tr>
<td>KCPE</td>
<td>Kenya Certificate of Primary Education</td>
</tr>
<tr>
<td>KCSE</td>
<td>Kenya Certificate of Secondary Education</td>
</tr>
<tr>
<td>KICD</td>
<td>Kenya Institute of Curriculum Development</td>
</tr>
<tr>
<td>KLB</td>
<td>Kenya Literature Bureau</td>
</tr>
<tr>
<td>KNEC</td>
<td>Kenya National Examinations Council</td>
</tr>
<tr>
<td>NCTM</td>
<td>National Council of Teachers of Mathematics</td>
</tr>
<tr>
<td>RIP</td>
<td>Rest in Peace</td>
</tr>
<tr>
<td>SACMEQ</td>
<td>Southern and Eastern African Consortium for Monitoring and Education Quality</td>
</tr>
<tr>
<td>SMASSE</td>
<td>Strengthening of Mathematics and Sciences at Secondary School Education</td>
</tr>
<tr>
<td>SPSS</td>
<td>Statistical Package for Social Sciences</td>
</tr>
<tr>
<td>UNESCO</td>
<td>United National educational Scientific and Cultural Organization</td>
</tr>
</tbody>
</table>
Mathematics is the foundation of scientific and technological development of the nation. It is used as a basic requirement for entry into the prestigious courses such as Medicine and Engineering. Despite the importance of the subject in the society, there has been poor performance in the Kenya Certificate of Secondary Education. The study investigated English language competence of the students and the performance in Mathematics in Bungoma East Sub-County. The purpose of the study was to determine the influence of students' English language competence on Mathematics performance. The target population of students was 13328 and 399 teachers. The study used descriptive survey method. The study randomly sampled 400 Form two students to sit English language competence tests and Mathematics word and non-word problem tests. The sample of students represents 10.78 per cent of all Form two students in the Sub-County. On the other hand, forty Mathematics teachers were randomly sampled to fill a questionnaire. The sample of teachers represented 10 per cent of the teachers in the Sub-County. Content and construct validity of English and Mathematics tests were ensured as the students' test items were adapted from Kenya National Examinations Council past papers and a pilot study was conducted while reliability coefficient was determined by Kuder-Richardson formula (KR-20). The data were analyzed using descriptive methods such as percentages and means. Inferential data analysis was carried out using student t-test and Pearson Correlation Coefficient. Students t-test was found by comparing students' mean scores of Mathematics word and non-word problem tests while Pearson product correlation coefficient was used to determine the influence of students' English language competence on Mathematics performance. Students performed better in non-word problem test compared to word problem test. The study found that there is positive correlation (r = 0.9649, α = 0.05) between English language competence and Mathematics performance in secondary schools in Bungoma East Sub-County. It was also found that boys performed better than girls in Mathematics competence tests. It was, therefore, concluded that there is a strong positive correlation between English language competence and Mathematics performance in secondary schools. It is recommended that students learn English language effectively and teachers of Mathematics and the Kenya National Examinations Council use simple English language to improve the performance of students in Mathematics.
CHAPTER ONE
INTRODUCTION

1.1 Preamble
This chapter gives an overview and basis for the study. It provides the background to the study, statement of the problem, purpose, objectives, research questions, assumptions, limitations, delimitations, significance, theoretical and conceptual frameworks, operational definition of terms and acronyms.

1.2 Background to the Problem
Mathematics as a subject is compulsory and has a lot of weight as far as future careers of secondary school graduates is concerned. Most careers require a pass in Mathematics. According to Cockcroft report (1982), there is general agreement that every child should study Mathematics in school. The subject is regarded as one of the most important in the curriculum and often equated with clear thinking and ability to solve problems. It is for these reasons that there is greater pressure for children to succeed in Mathematics. The subject is further emphasized when future employment of a child is being considered with parents almost unanimously wanting for their children to succeed in the subject, largely in the hope that job prospects will be improved. In Kenya, Mathematics is a compulsory subject up to the secondary school level. Mathematics is the foundation of many fields such as Medicine, Engineering, Agriculture and Commerce. It is applied in everyday life such as budgeting and purchasing of household goods, sports and games.
and construction works. The subject is a powerful means of communication using special terminologies and symbols. It has an aesthetic value. The beauty around us especially in construction works is due to Mathematics. It is a tool of investigation especially in research work.

For a number of years, students’ performance in Mathematics in national examinations has dropped a great deal. This has been a major concern for the society (Kenya National Examinations Report, 1996). Table 1.1 and Figure 1.1 show KCSE performance by gender in English and Mathematics for the years 2006 -2009. Performance in English was considered in order to find out its influence on students’ performance in Mathematics.

Table 1.1: KCSE Performance by Gender in English and Mathematics for the years 2006 to 2009 in Kenya

<table>
<thead>
<tr>
<th>subject</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>F</td>
<td>M</td>
<td>F</td>
<td>M</td>
</tr>
<tr>
<td>ENG (%)</td>
<td>39.8</td>
<td>39.7</td>
<td>39.7</td>
<td>39.7</td>
</tr>
<tr>
<td>MATHS (%)</td>
<td>15.5</td>
<td>21.9</td>
<td>15.7</td>
<td>23.1</td>
</tr>
</tbody>
</table>

Source: The KNEC Reports: 2006-2009
Table 1.1 represents percentage mean scores in English and Mathematics for the years 2006 to 2009 in the Kenya Certificate of Secondary Examination. The performance of boys and girls in English and Mathematics is poor. The average mean mark in both subjects over the years 2006 to 2009 is below the expected mean mark of 50 per cent. For each of the years under consideration, the mean scores for English are relatively better than those of Mathematics. The girls and boys tied up in English for the years 2007 and 2008 but boys overtook the girls in 2009. Boys had higher percentage mean scores in Mathematics compared to girls over the four years under consideration.

The current trends as far as performance in English and Mathematics is concerned are similar (KNEC report, 2014). In the year 2013, girls had a mean score of 27.83 per cent while boys had 27.18 per cent in English. In the year 2014, girls had a mean score of 39.44 per cent while boys had 38.33 per cent. On the side of Mathematics, boys had a mean score of 30.13 per cent while girls had 24.51 per cent in the year 2013. In the year 2014, boys had a mean score of 26.40 per cent while girls had 21.26 per cent. The observation was that boys performed better than girls in Mathematics.
Figure 1.1: Comparison of performance of Boys and Girls in Mathematics

Figure 1.1 shows that boys perform better than girls in Mathematics. The percentage mean scores for boys and girls are below 25 per cent for all the four years under consideration (2006 to 2009). This implies that the performance in KCSE Mathematics is below expectation of 50 per cent. However, it is notable that the overall performance shows an increasing trend in the mean scores.

Performance in Mathematics in Kenya Certificate of Secondary Examinations (KCSE) in Bungoma East Sub-County has been of great concern among stakeholders. For six years
running (2008-2013), only one school has achieved a mean score of six and above out of maximum of twelve.

Table 1.2: Bungoma East Sub-County KCSE Performance by gender in English and Mathematics for the years 2010 to 2013

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>ENG. MEAN SCORE</td>
<td>4.98</td>
<td>4.23</td>
<td>5.12</td>
<td>4.83</td>
<td>5.27</td>
<td>4.84</td>
<td>4.37</td>
<td>3.82</td>
</tr>
<tr>
<td>MAHS MEAN SCORE</td>
<td>3.61</td>
<td>3.54</td>
<td>3.37</td>
<td>3.01</td>
<td>3.32</td>
<td>3.18</td>
<td>2.97</td>
<td>2.65</td>
</tr>
</tbody>
</table>

Source: Sub-County Education Office, Bungoma East

Table 1.2 shows KCSE mean scores for Bungoma East Sub-county by gender in English and Mathematics for the years 2010 to 2013. The scores are out of a maximum of twelve. The mean scores in both English and Mathematics are below the expectation of six in Bungoma East Sub-County. There was overall improvement in the performance of English from 2010 to 2012 but a drop was realized in the year 2013. On the side of Mathematics, an overall drop was realized in 2011 but an improvement noted in 2012 which was followed by a drop in the year 2013. It is observed that both subjects had an improvement in 2012 and a drop in 2013. During the period under consideration, girls performed better than boys in both English and Mathematics. The study was to determine
the influence of students' English language competence on the performance of Mathematics in Bungoma East Sub-County.

Studies undertaken indicate that many factors contribute to poor performance in Mathematics. These factors include negative attitude by teachers and learners, poor teaching methods, inadequate textbooks and poor utilization of time (Eshiwani, 1982; Irumbi, 1990; Miheso, 2002). However, one factor which has not been given the consideration it deserves is competence in English language. Some studies have indicated that the language problem is one of the major factors contributing towards poor performance of students in Mathematics especially those who are bilingual or multilingual (Secada, 1992; Barton and Barton, 2005). Language is the vehicle for communicating ideas and thoughts in talking to others in ordering and marshalling our own thinking. It consists of "words" but words are labels for concepts and ideas, so it is difficult to separate issues of language from issues of learning (Orton & Frobisher, 1996).

The language of Mathematics involves a very large vocabulary, including very many everyday words as well as the mathematical specialist terminology, sometimes referred to as the mathematical register. Some words seem to occur within Mathematics and nowhere else, for example "polygon" and "isosceles," but such words are rare. This suggests they will cause problems for some children, but at least they always mean the same thing, so their origins, roots and derivations can be explained and their meanings can theoretically be learned without confusion with usage in ordinary English. Mostly,
however, mathematicians seem to have adopted fairly common words as technical terms, which have taken on new meaning within Mathematics, for example difference, mean, segment, degree, root and derivative. Some of these words have occurred in other contexts with a meaning quite different from the one in Mathematics.

For some of these words the distinction between the meaning within Mathematics and the meaning in everyday speech is quite subtle, the meaning being similar but not same and this creates a peculiar problem. Children need to be able to read the Mathematics of learning materials, from published textbooks to handwritten work cards. Basically, children need to be able to read and understand the text of Mathematics learning materials without the particular language used acting as an obstruction or deterrent. Although measures of readability exist, they are difficult to apply to the kind of mixture of everyday language, specialist terminology and mathematical symbols which make up the pages of Mathematics book and work sheets.

Speaking is another important element in the development of language facility, and most people find it easier to write than to speak, yet in Mathematics lessons, we have traditionally relied almost exclusively on the use of pencil and paper (writing) methods. Straker (1993) reminds us that children experience difficulties in learning Mathematics since they are generally offered more practice with pencil and paper, not the kind of talk and discussion with others which might be so much more valuable. Pimm (1987) gives reasons for encouraging children to talk as follows:
(i) To communicate thoughts and ideas to others
(ii) To allow the teacher to gain insight into a child’s thought process
(iii) To better enable the children to reflect

In addition, Orton and Frobisher (1996) point out that there is certainly a place for specific attention to language within Mathematics lessons.

1.3 Statement of the Problem

The general performance in Mathematics among secondary school students in Kenya has been poor for many years (KNEC, 2000). There is evidence that many of the serious problems facing secondary school Mathematics instruction today should not be attributed to deficiencies in the curriculum, teaching or assessment but emanate from instructional language rather than the inherent difficulties of the subject (Wasike, 2003). The language policy in Kenya stipulates that English language is the medium of instruction at the secondary school level (Bogonko, 1992). It is for this reason that Mathematics is taught in English from an early age.

Despite the efforts made by the Ministry of Education in Kenya to improve performance in Mathematics and in particularly Bungoma East Sub-County, not much has been achieved. Such efforts have included among others, supply of qualified teachers of Mathematics, provision of teaching materials and in some cases, revision of secondary school Mathematics curriculum (Njoroge, 2003). In addition, the Mathematics teachers have been going through formal in-service training through such initiatives such as
strengthening of Mathematics and sciences at secondary school education to improve their delivery skills. However, such efforts have often ignored the influence of language in the learning of Mathematics. Austin and Howsin (1979) point out that there are many aspects of the issue of language and Mathematics which might affect learning. There is, therefore, a need to look at the role English language plays in the students' performance in Mathematics. The purpose of the study was to investigate the influence of students' English language competence on Mathematics performance in secondary schools, Bungoma East Sub-County with a view to improving performance.

1.4 Purpose of the Study

The purpose of the study was to determine the influence of students' English language competence on Mathematics achievement with a view to improving the performance in Mathematics in Bungoma East Sub-County, Bungoma County.

1.5 Objectives of the Study

The objectives of the study were to:

(a) Establish students' English language competence in relation to understanding Mathematics problems.

(b) Determine influence of students' English language competence on performance in Mathematics.
(c) Determine relationship between students’ gender and English language competence in understanding Mathematics concepts.

(d) Establish strategies that would improve performance in Mathematics in Bungoma East Sub-County secondary schools.

1.6 Research Questions

(a) To what extent does students’ English language competence affect the understanding of Mathematics problems?

(b) Do students’ English language competence determine the performance in Mathematics?

(c) Is there any relationship between students’ gender and performance in Mathematics?

(d) What strategies would improve the performance in Mathematics in Bungoma East Sub-County?

1.7 Assumptions of the Study

The assumptions of the study were:

(a) All secondary schools under investigation had covered same content at the time of the study.

(b) All Mathematics teachers in the schools under investigation were qualified.

(c) All the schools under investigation were equipped with Mathematics learning physical resources.
(d) Students' entry behaviour in secondary schools was the same.
(e) Teachers' English and Mathematics proficiency is higher than that of students.

1.8 Limitations of the Study

(a) The respondents were drawn from one Sub-County only which may not have been a true reflection of other Sub-Counties in Kenya as a country.

(b) The time required to access more schools was limited and financial constraints did not allow extension of the study to other Sub-Counties.

(c) Some respondents failed to answer some questions.

The researcher had to work overtime and sought for financial assistance from a co-operative society. Research assistants were also incorporated to support the researcher on data collection where the need arose. In cases of unanswered questions, the researcher had to interpolate by analyzing how similar items had been responded to.

1.9 Delimitations of the Study

The study on English language competence and Mathematics performance among secondary school students took place in Bungoma East Sub-County of Bungoma County, Kenya using descriptive research design. The Sub-County had a total of thirty-eight secondary schools. A sample of eight out of thirty-eight schools was selected. Private schools were excluded since some were offering a different curriculum compared to public schools. Data were collected by the researcher and eight research assistants using
questionnaires and tests of attainment. The study sought to determine the influence of students’ English language competence on performance in Mathematics in Bungoma East Sub-County.

1.10 Significance of the Study

The findings would be useful to the Mathematics teachers as they would acquire knowledge on the students’ English language competence and their performance in Mathematics. Consequently, this would enhance teaching and learning of Mathematics in secondary schools. The findings would enable KICD take into consideration English language as an issue while preparing the Mathematics curriculum. Mathematics teacher trainers would find it useful while preparing teacher trainees on the need of using appropriate English language for better learning of Mathematics. The findings would enable textbook authors to prepare materials for Mathematics teaching and learning with simplified English language suitable for a particular level. Mathematics examiners would find it necessary to gauge the language used in Mathematics test items in order to boost the performance. Learners of Mathematics would recognize the importance of English language as the medium of instruction.

1.11 The Theoretical Framework

According to Bruner (1966), what determines the level of intellectual development is the extent to which the child has been given appropriate instruction together with practice or experience. Language is important for the increased ability to deal with abstract concepts.
Bruner argues that the use of words can aid the development of the concepts they represent. It is through language that we can learn about objects and how to understand them. Language is also the basis of our thought processes. In this sense, our language shapes to a large extent that which we are able to learn and know.

This study is supported by the linguistic relativity theory which states that the structure of one's first language affects one's thought processes. One of the key proponents of this theory is Whorf (1956) who argues that large differences in language lead to large differences in experience and thought. Whorf points out that the structure of language affects the ways in which respective speakers conceptualize their world, i.e their world view, or otherwise influences their cognitive process.

It is generally recognized that linguistic abilities affect performance in Mathematics. Language plays a key role in the teaching, learning, understanding and communication of Mathematics. Mathematics is made meaningful through the use of language and students should be enabled to adequately communicate in the language of Mathematics. The study was guided by the fact that English language being the medium of instruction affects the teaching and learning of Mathematics in secondary schools.

1.12 The Conceptual Framework

A conceptual framework is a scheme of concepts (variables) which the researcher operationalized in order to achieve set objectives (Oso & Onen, 2005). Figure 1.2 is the
conceptual framework for the study concerning students' English language competence and Mathematics performance.

Figure 1.2: Conceptual Framework

Source: Adapted from Njeru, 2010 and Njoroge, 2003

In the scheme in Figure 1.2, students' English language competence is hypothesized to influence the performance in Mathematics. English language competence is determined by students' grammar, vocabulary to interpret texts and application of English structure, spelling, readability of textbooks, pronunciation and writing skills. The scheme postulates
that students' performance in Mathematics is dictated by writing of words and symbols, explanation of symbols and terminologies, solving Mathematics problems and mean score. The higher the mean score, the better the performance in Mathematics. However, the relationship may be modified by entry behaviour, gender and strategies such as learning resources and teaching methods. Teaching resources influence gender while teaching resources interact with teaching methods to give the desired output (performance).

1.13 Operational Definition of Key Terms

For the purpose of this study, the words used have the following meanings:

Sub-County- is the decentralized unit through which county governments in Kenya provide functions and services.

English language competence- ability to have efficient command of grammar, vocabulary to interpret texts and applying certain English structure effectively for the intended purpose.

Mathematics performance- level of attainment by a learner in any or all Mathematics skills.
Secondary school- A school that is intermediate in level between elementary school and college and that usually offers general, technical, vocational, or college-preparatory curricula. Forms One, Two, Three and Four are the four levels in ascending order in a secondary school.

Strategies- these are the plans chosen to bring about desired future, such as achievement of a goal or solution to a problem.

Gender- Male or female students in secondary schools.

1.14 Chapter Summary

In this chapter, possible causes of students’ poor performance in Mathematics have been highlighted. Among other issues considered, the chapter provides the background to the study. Students in Bungoma East Sub-County secondary schools were at the centre of investigation. Bungoma East Sub-County provided the largest area which was relevant to research questions and objectives (Kombo & Tromp, 2006). The geographical location of Bungoma East Sub-County made it easily accessible to the researcher.
CHAPTER TWO

LITERATURE REVIEW

2.1 Preamble

In this chapter, related literature was reviewed. There was discussion on performance in Mathematics in secondary schools of Kenya. Alongside the performance in the subject, factors which determine the attainment were highlighted. The issue of language used in teaching and learning of Mathematics were also given a focus in this chapter.

2.2 Students’ Performance in Mathematics

Studies which have been conducted on the performance in Mathematics at various levels of learning indicate that Mathematics is generally performed poorly. Eshiwani (1982) points out that one of the factors leading to poor performance in the subject is negative attitude by the teachers and learners. This is supported by Irumbi (1990) and Miheso (2002). The study also reveals poor teaching methods; non-conventional curriculum and the problem of linguistic transfer that did not make learners develop and internalize good concepts in the subject. On the side of the curriculum, Eshiwani (1982) clearly says that the Mathematics syllabus at high school level is unnecessarily long and schools are given short time to cover. Kibanza (1980) argues that students’ aspirations (future plans), sex difference, and socio-economic background have direct relationship with achievement in Mathematics. Irumbi (1990) points out that teachers’ academic and professional qualifications, availability of textbooks and proper utilization of time are some of the
factors related to the performance in Mathematics. Mwangi (1986) points out that lack of textbooks and poor utilization of time leads to poor performance in Mathematics.

In Kenya, Mathematics is a compulsory subject up to the secondary school level. During the last couple of years, performance in Mathematics in national examinations has dropped significantly, and this has been a major concern for the society (Kanja, 2001). The Kenya National Examinations Council Mathematics report (1996) identifies reasons for poor performance as inadequate coverage of the syllabus, practice and inability to master simple and basic concepts. According to the study carried out on general issue, a characteristic of teaching methods was observed as students worked less by themselves and the teacher served as the sole source of information.

In the year 2009, girls scored a mean of 18.1 per cent in Mathematics compared to 23.63 per cent for boys (East African Standard 24th March, 2010). Do we blame teachers? The bottom line is that performance in Mathematics in KCSE for many years has not been impressive. Taking into account that this was the second lowest mean score among twenty subjects sat in the year 2009, there could be other causes of poor performance in the subject rather than the assumed girls low academic abilities. According to UNESCO, the challenge of Mathematics in secondary schools has to do with how the subject is taught from primary. “Some students finish primary school with Mathematics ability of standard two and three pupils,” says SACMEQ report. In addition, Uwezo Kenya National Report (2011) indicates that children in Kenya graduate from primary schools
but do not have reading and counting skills. Only one third of children in class three have competences expected at class two. Even worse, in numeracy, nearly one out of ten children in class eight today cannot do class two level division.

Mulupi (2011) points out that students continue to perform poorly in Mathematics despite the Ministry of Education in Kenya in collaboration with the Japanese Government initiating SMASSE programme to boost performance. In his study, it was found that consultation time influences students’ performance in Mathematics while teaching and learning resources availability do not influence performance. In the same study, it was concluded that teacher-student ratio does not influence performance of students. Teachers cited students’ attitudes and school programmes as the main challenges facing Mathematics. On the other hand, students suggested exposure to more Mathematics symposia, extra work and weekly tests to improve the mean score of Mathematics in schools.

Generally, there are many factors that dictate the performance in Mathematics in Kenyan secondary schools. The studies which have already been undertaken may not be exhaustive on these factors. Studies undertaken focused mainly on the methods of teaching Mathematics. English language which is used as a medium of instruction in Mathematics has not been given a serious consideration. Aspects of English language such as grammar, spelling, writing skills, vocabulary to interpret texts and application of structure have been neglected.
2.2.1 Factors Contributing to poor Performance in Mathematics

Mbugua (2012) found factors contributing to students’ poor performance in Mathematics in Baringo County. The following findings were positive on the teaching and learning of Mathematics in secondary schools, Baringo County:

- Kenya Certificate of Primary Education (KCPE) marks were not low to warrant poor performance in the subject
- Almost all teachers (94%) were professionally trained with Bachelor of Education degrees. Therefore, their output was expected to be good. Wayne and Young (2000) point out that secondary school students learn more Mathematics from teachers with degrees or significant coursework in Mathematics.
- Teachers’ attitude towards Mathematics was positive and most were effective in teaching.

The factors which were identified that contribute to poor performance in Mathematics were put in three broad categories:

(a) School-Based Factors

(i) Poor teaching methods

There are several instructional methods available to a teacher to choose from (Twoli et al., 2007). The choice of teaching method depends on the subject, level of learners and
nature of topic or objectives for the lesson. Generally, there are very many variables that determine choice of the method one uses at a given time of teaching.

Some teachers use the lecture method which is ineffective. Costello (1991) states that lecture method is ineffective in that it turns the learners into passive participants in the teaching process. Discussion, project and discovery methods create an enabling environment for the learners and ensures that individual differences are catered for. This is in agreement with Miheso (2002) who points out that teachers do not use student-centred approaches, lack of experiments and practical modeling activities.

(ii) Teaching and learning resources like textbooks are a major input for performance in examinations. Resources are aids that teachers use to assist learning and increase interest in learning (Twoli et al., 2007). Since students' interests and abilities are varied, the teacher will need to select and use a variety of resources in teaching to take care of individual differences in class. In Mathematics, some of the resources are: text books, geometrical sets, scientific calculators and models. Psacharopolous and Woodhall (1995) observe that availability and quality of textbooks in a secondary school are strongly related to achievement. Eshiwani (2001) points out that poor performance in Kenya is due to acute shortage of textbooks. The fact that many students would share one textbook in some schools makes it impossible to complete their homework.

(iii) Mathematics teachers were overloaded. Some were teaching over thirty lessons in a week yet the Ministry of Education recommends a maximum of twenty seven.
(iv) The syllabus is overloaded which needed remedial lessons to cover in good time.

(b) Socio-economic Factors

(i) Students’ parents / Guardians Education

Most parents did not have good education and therefore do not act as good role models. Desarrollo (2007) indicated that the extent to which parents or other family members are actively engaged in a student’s education determines the student’s achievement.

(ii) If parents have low income, it contributes to inadequate learning resources, hence low achievement for a student.

(c) Students’ Personal Factors

The cause of most failures in schools might not be due to insufficient or inadequate instruction but by active resistance by the learner (Mwamwenda, 1995). This argument suggests that favourable attitudes towards Mathematics should be developed for better achievement.

2.2.2 Gender and Mathematics Performance

Orton (1987) clearly puts it that evidence from around the world that there are sex-related differences in Mathematics ability is not consistent. In many countries the post-primary pattern is the same; more boys than girls succeed in public examinations taken around age 16, many more boys than girls choose Mathematics as one of their specialist
subjects, and comparatively few females have, in the past, taken up employment directly related to Mathematics or dependent on qualification in Mathematics. There is strong indication that, in a variety of ways, girls have been consistently discriminated against in terms of Mathematics education.

Recent studies in many parts of the world indicate stereotypes about female inferiority in Mathematics are a sharp contrast with scientific findings. Elsie-Quest (2010) examined data from the internationally recognized trends in international Mathematics and Science study and the programme for international students’ assessment, representing about half a million secondary school students aged 14-16 from 69 countries. It was found that girls perform at the same level as the boys when they are given the right educational tools and visible female role model excelling in Mathematics (The East African Standard, 24th March, 2010).

Kibanza (1980) found that there were significant sex difference in achievement in Mathematics in favour of boys at the higher cognitive levels while at lower levels no significant sex differences existed. Mwangi (1986) showed that sex of the students was significantly related to performance in favour of boys. However, that finding was biased towards age bracket of between 16-18 years (Irumbi, 1990). It was noted that although pupils in this age bracket were mainly in secondary schools, a few of these were at primary school level.
Njeru (2010) carried out a study using a cross-sectional descriptive survey design to find out the relationship between students' gender and Mathematics performance. The study randomly sampled 333 form three students which involved 175 girls and 158 boys. It was found that girls had a higher mean score of 14.05 compared to boys with a mean score of 11.97. These findings did not agree with known trends from the KCSE results in which boys always perform better than girls in Mathematics. For example in the year 2013 at national level, boys had a mean score of 30.13 per cent while girls had 24.51 per cent in KCSE Mathematics results. In the year 2014, boys had a mean score of 26.40 per cent while girls had 21.26. Rauta (2013) conducted a study to find out factors influencing performance of girls in Mathematics in KCSE in public secondary schools. The study employed descriptive survey research design based on a cross-sectional descriptive research and a total of 218 students were involved. She found that boys performed better than girls in the subject. It was, however, noted that the sample size was not appropriate. Given that the study took place in Westlands District, Nairobi county which is cosmopolitan, there is greater diversity and differences that exist in the population. Therefore, a larger sample size should have been used to reduce the sampling error. On the other hand, the researcher used simple random sampling which may have led to some sub-groups not get good representation.

The bone of contention is the overall poor performance of boys and girls in Mathematics. In this study, the influence of students' English language competence on Mathematics
performance was considered in view of improving the performance of Mathematics in secondary schools.

2.3 English Language used in Mathematics

This section provides an overview of the language used in teaching, learning and assessment of Mathematics. Various aspects of language were considered. These aspects were: Language used in formation of Mathematics concepts, Mathematics as language, implications of English language in learning and teaching of Mathematics and language used in Mathematics texts.

2.3.1 Language in Formation of Mathematics Concepts

Mathematics concepts are abstract ideas (Orton and Frobisher, 1996). Language and thought are linked in a genetic circle where each necessarily leans on the other, in an independent formation and continuous reciprocal action. In the last analysis, both depend on intelligence itself, which antedates language and is independent of it (Piaget, 1954). This argument is supported by Sapir (1963) who pointed out that the feeling entertained by many that they can think, or even reason without language is an illusion. However, Skemp (1971) quotes a number of illustrations which, it is claimed show the formation and use of low order concepts without use of language. For example, animals behave in ways from which one may reasonably infer that they form simple concepts. Chimpanzees can learn to sit at the table and drink from a cup, not talk. Both Piaget (1954) and Vygotsky (1962) provide some evidence that the development of linguistic structure in
some cases precedes the appreciation of the corresponding logical relations. In Piaget’s experiment, he suggests that children use subordinate clauses like *because* and *unless* before they understand the logical relationship. He argues that this means grammar comes before logic. In Vygotsky’s experiment, he asked if pre-school children would interchange names of objects like call “a cow” as “dog”. This did not happen and in his conclusion, he said concept and language are linked and concept formation relies on language development. Therefore, language is important in the formation of Mathematics concepts. The study considered the role language plays in the formation of Mathematics concepts.

### 2.3.2 Mathematics as a Language

A language is a means of communication (Orton & Wain, 1994). This view is supported by Cockcroft (1982) who says the usefulness of Mathematics provides a means of communication which is powerful, concise and unambiguous. Mathematics can be used to present information in many ways, not only by means of figures and letters but also through use of tables, charts and diagrams as well as graphs and geometrical or technical drawings. A point which is often made is that Mathematics is a unique universal language since it cuts across social- cultural and linguistic barriers. It has symbols and syntax that are accepted all over the world. Additionally, Mutunga and Breakell (1987) stress that Mathematics provides a means of communicating which is concise and powerful, not least because of symbolism.
On the contrary Austin and Howsin (1979) describe the statement that Mathematics is a language as "somewhat dangerous and potentially confusing." They say Mathematics is a body of accumulated knowledge. The subject in theory may be enacted and described in a variety of languages, although an internationally recognized syntax and vocabulary has developed the system of symbols and terminology is not Mathematics itself. The language in which Mathematics is presented is actually not so precise or consistent as might be popularly supposed. Rukangu (2000) points out that a Mathematics teacher is required to consider various variables as he prepares to start a communication process. The variables are shown in Figure 2.1:
Figure 2.1: A theoretical model of communicative Mathematics class

Source: Adapted from Rukangu (2000).

If a teacher intends to communicate a mathematical concept using mathematical language, he/she needs to know the student’s entry behaviour. The teacher should consider student’s proficiency in written and spoken languages used as a medium of
instruction (Rukangu, 2000). It is important to note that English language is used as a medium of instruction. For better classroom interaction, the teacher should know the level of students' mathematical knowledge through spoken or written systems. Formation of mathematical concepts needs students to effectively apply styles of reading and writing mathematical concepts. On the other hand, learners need to recognize the mathematical language structure so as to understand the context in which it is being applied. The teacher should also evaluate the communication effects of the mathematical concepts, which is as a result of symbolized mathematical concepts. From the Figure 2.1, language is a means through which a communication process in a classroom may be accomplished. Therefore, English language plays a key role in a Mathematics classroom with reference to Kenyan secondary schools.

2.3.3 Implications of English Language in Learning and Teaching of Mathematics

The role of language in the teaching of Mathematics has been noted in many curricula. For instance, communicating mathematical ideas is among the twelve components that are considered by the National Council of Supervisors of Mathematics (NCTM) as an “essential for any successful Mathematics teaching and learning process” (Ellerton & Clarkson, 1996). This position has also been endorsed by NCTM in the principles and standards for school Mathematics.

The NCTM (2000) standards have also elaborated that all students in general, and second-language learners in particular need to have opportunities as well as to be given
encouragement and support for speaking, writing and listening in Mathematics classes. In particular, this practice will help second language learners overcome barriers and thus facilitate communication in teaching and learning of Mathematics. Barton and Barton (2005) undertook a study to understand the relationship between English language and Mathematics learning for students whom English is an additional language (EAL). They were interested in exploring the extent of any difficulties in Mathematics attributable to low proficiency in English language, and also discovering particular language features that might cause problems. Their studies offered quantitative and qualitative evidence that EAL students suffer a disadvantage of about 10-15 per cent in Mathematics. The language features causing difficulties varied across the studies, and appeared to depend on the mathematical level as well as the home language and English proficiency levels.

A report by the Kenya Teachers Colleges Principals points out that teachers who had failed Mathematics in KCSE or scored low grades teach most pupils in primary schools (The East African Standard 24 th March, 2010). The report says “most of them had D+ and C- in KCSE and failed in Mathematics, Sciences, Kiswahili and English” subsequently the impact of poor primary teachers is being felt as pupils join secondary schools without basic skills in Mathematics. The crisis is intensified by poor language skills among teachers who are unable to explain basic Mathematics concepts in English. Even in secondary schools, some teachers are unable to communicate effectively in English and use mother tongue to teach Mathematics although examinations are set in English.
In the year 2009, the national mean score in English was below 40 per cent, a score that illustrates a lot has to be done towards improvement of language. The mean score in English for girls was 39.18 per cent while boys had 39.33 per cent. Such statistics reveal that most students go through secondary schools without learning basic language. Nevertheless, it has been noted that the attention given to the centrality of language factor by Mathematics educator and researchers in both the research and practice domain is "little than lip service" (Ellerton & Clarkson, 1996). One of the reasons why the language factor needs special attention these days is the fact that many students are currently learning Mathematics in their second or third language (Austin & Howsin, 1979; Ellerton & Clarkson, 1996). The phenomenon was gradually becoming a norm rather than the exception (Secada, 1991). This was due to the legacy of colonialism and multiplicity of local languages in the developing countries like Kenya.

Njeru (2010) had a study on students’ English language competence in solving word problems and Mathematics competence. In the study, 341 form three students were randomly sampled for the study. It was found that there is a strong positive relationship between English language competence and solving word problems in Mathematics. The implication is that a student who is competent in English language has a high chance of doing well in Mathematics. The same study indicated that ninety per cent of teachers acknowledged that students had difficulties in learning Mathematics in English as the language of instruction. It was noted in the study that key aspects of English language competence like grammar were not considered. The data were also analyzed using
analysis of variance (ANOVA) which is held on the assumptions of homogeneity of variance, independence of observations and the null hypothesis.

Manyara (2011) points out in a study of influence of students’ English language competence on Mathematics performance in secondary schools that majority of the students lacked communication skills to enable them to perform well in Mathematics. The study used cross-sectional descriptive survey research design and 248 form three students were randomly selected for the study. Over two thirds of the students scored averagely and below average in matching the words with ordinary English meaning while 86.7 per cent of the teachers acknowledged that students English language ability affected performance in Mathematics. The performance of students in Mathematics becomes usually an issue in form two when new topics are introduced in secondary schools. Therefore, it was more appropriate to have a study using form two students. The fact that Manyara used simple random sampling, some sub-groups in the population may not have been represented. Abiri (2013) points out that the major challenges facing students in learning English are, frequent use of mother tongue by students, uncooperative teachers, misunderstanding of concepts like grammar, spelling, pronunciation and poor writing skills. It is important that the issue of English language and its impact on the teaching and learning of Mathematics is given a focus.
2.3.4 Language Used in Mathematics Texts

Jonson and Rising (1972) point out that mathematics textbook is a major factor in determining what Mathematics topics are taught and how they are taught. Many at times a textbook has dictated the scope, the sequence, and even the pace of the Mathematics programme. One significant change in Mathematics teaching over the past twenty years or so is the increasing demand on pupils to read and write in Mathematics lessons (Bell, 1983). Texts are used only as a source of examples, but as a medium of instruction; and the use of work-cards and independent learning has emphasized this even more.

Austin and Howsin (1979) point out that increasingly authors use easier words and less complicated linguistic forms. This restriction of language is unsatisfactory in itself, and leads to the down-grading of word problems and a tendency to the “verbal cue” situation (Nesher & Teubal, 1975). But language difficulties may hamper development of mathematical ability of pupils. Call and Wiggin (1966) showed that the provision of special reading instruction can help to improve performance in the solution of word problems.

Njeru (2010) found in a study that 50 per cent of the teachers prefer using secondary school Mathematics by KLB since simple English language is used. Manyara (2011) puts it that teachers were unanimous on preference for the same books due to simple English language.
To solve language problem in the use of textbooks, Rothery (1980) suggests the following:

- Use of short sentences
- Use of simple words
- Remove unnecessary expository material
- Keep to the present tense and particularly avoid the conditional mood. For example, “if butter cost 2 a pack, how much would 5 packets cost?” can be replaced by “Butter costs 2 a pack. How much do 5 packs cost?”
- Avoid sentences structure which involves the reader having to remember clauses presented initially
- Improve the teacher’s use of text- Provide the right text to the teacher
- Improve the reading ability of the learner

In conclusion, the language used in Mathematics texts should be to the level of the learner. This facilitates proper learning of the subject.

2.4 Strategies for Improving Mathematics Performance

The following strategies have been identified by studies already undertaken;

(a) Njeru (2010) found a strong positive correlation between students’ English language competence in solving word problems and Mathematics performance. The study recommended a lot of emphasis on teaching English language to students by both
Mathematics and English teachers in order to improve the performance. In addition, teachers should use English language which is at the level of the learners to enable them to acquire language gradually as they move to higher classes.

(b) Manyara (2011) points out that students should be encouraged to speak English regularly to improve mastery of language that will in turn boost their performance in Mathematics.

(c) Rauta (2013) suggests that parents should be involved in supporting the learning of Mathematics by providing learning resources like textbooks, geometrical sets and scientific calculators. The study proposes regular assessment tests for learners and refresher courses and workshops for teachers and effective career counselling services for students. Njeru (2010) proposes that textbook authors should use simple English to improve readability of such books by students.

Mbugua (2012) points out that to improve performance in Mathematics, the government needs to enhance provisions of learning and teaching materials and equipment to schools. Textbooks are vital in all learning institutions as they act as guides to what is to be learnt at all levels. Textbooks improve readability of students, hence, improving English language competence. The government should extend loan facilities and bursaries to secondary school students from poor families.
The chapter provides literature review. Students' performance in Mathematics was considered. The poor performance by students in KCSE Mathematics is attributed to a number of factors. Among these factors are: negative attitude by teachers and learners, poor teaching methods, teachers' academic qualifications, inadequate textbooks, poor utilization of time and low entry behaviour from primary schools. Other issues which have been discussed include: English language used in Mathematics, Mathematics as a language, implications of English language use in teaching and learning Mathematics, language used in Mathematics texts and strategies for improving the performance in Mathematics. It is notable that many of the studies undertaken on English language competence and the performance in Mathematics have not been given the weight they deserve. Grammar as a key aspect of English language was not considered. Njeru (2010) and Manyara (2011) on the study about influence of Students' English language competence on Mathematics performance, used form three students. This study used form two students since the challenge of Mathematics starts at that level when new topics in Mathematics are introduced to the learners. The studies undertaken by Njeru (2010) and Manyara (2011) employed simple random sampling which has a limitation of not providing good representation of sub-groups in a population unlike this study which used stratified sampling that took care of all the sub-groups. In addition, Njeru (2010) used analysis of variance which was based on the assumptions of homogeneity of variance, independence of observations and the null hypothesis. It was necessary that the study be
extended to other regions of the country like Bungoma East Sub-County to emphasize the influence of students’ English language competence on the performance in Mathematics.
CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Preamble

The chapter highlights the techniques which were employed in the study. It discusses the research design, location of study, target population, sample and sampling techniques, methods of data collection and data analysis.

3.2 Research Design

Orodho (2003) defines a research design as the scheme outline or plan that is used to generate answers to research problems. It is the conceptual structure within which research is conducted. Kothari (2003) points out that it is the blue print for the collection, measurement and analysis of data. The study design which was applied is descriptive survey method. This involves collecting data in order to answer questions concerning the current status of the population. Orodho and Kombo (2002) state that it can be used when collecting information about people’s attitudes, opinions, habits or any variety of education or social issues. The design employed correlation methods in order to achieve the objectives of the study. It involved collecting data from the three types of schools: National, County and Sub-County. It enabled the researcher to obtain students’ responses and teachers’ opinions about learning Mathematics in English language as the second language. The study consisted of teachers and students as the independent variables while performance in Mathematics was the dependent variable.
3.3 Location of the Study

The study was carried out in Bungoma East Sub-County, Kenya. The Sub-County is in the western region of Kenya and one of the nine Sub-Counties in Bungoma County. The Sub-County was chosen for study due to the fact that it has heterogeneity of the potential study population. In addition, the Sub-County was accessible to the researcher. Kombo and Tromp (2006) point out that accessibility should be considered for selection of a research site. Factors such as familiarity to the area, limitations of time and money influenced choice of research location (Gay, 1992). Table 3.1 shows the number of schools per category in Bungoma East Sub-County of Bungoma County.

Table 3.1: Types of Secondary Schools in Bungoma East Sub-County

<table>
<thead>
<tr>
<th>School Category</th>
<th>Number of schools</th>
</tr>
</thead>
<tbody>
<tr>
<td>National</td>
<td>1</td>
</tr>
<tr>
<td>County</td>
<td>8</td>
</tr>
<tr>
<td>Sub-County</td>
<td>29</td>
</tr>
<tr>
<td>Total</td>
<td>38</td>
</tr>
</tbody>
</table>

Source: Sub-County Education Office, Bungoma East

Table 3.1 shows that most schools in Bungoma East are in the Sub-County category with twenty nine in this category. Eight are County schools and one is a National school.
3.4 Target Population

Target population is the set of elements that the researcher focuses upon and to which results obtained by testing the sample should be generalized (Orodho, 2005). The target population consisted of 13,328 students in 38 public secondary schools in Bungoma East Sub-County. The public secondary schools were classified as National, County or Sub-County. In addition, each of the public secondary schools was either a boys school, girls school or mixed. The distribution of students in secondary schools is shown in Table 3.2.

Table 3.2: Distribution of Students in secondary schools in Bungoma East Sub-County

<table>
<thead>
<tr>
<th>School Category</th>
<th>Number of schools</th>
<th>Enrolment</th>
</tr>
</thead>
<tbody>
<tr>
<td>National</td>
<td>1</td>
<td>1208</td>
</tr>
<tr>
<td>County</td>
<td>8</td>
<td>3312</td>
</tr>
<tr>
<td>Sub-County</td>
<td>29</td>
<td>8808</td>
</tr>
<tr>
<td>Total</td>
<td>38</td>
<td>13328</td>
</tr>
</tbody>
</table>

Source: Sub-County Education Office, Bungoma East

3.5 Sample Size and Sampling Techniques

Sampling is the process of selecting a number of individuals or objects from a population such that the selected group contains elements representative of the characteristics found in the entire group (Orodho & Kombo, 2002). An effective population sample attempts to be as diverse as possible. The greater the diversity and differences that exists in the
population sample, the higher the applicability of the research findings to the whole population. Webster (1985) points out that a sample is a finite part of a statistical population whose properties are studied to gain information about the whole. When dealing with people, it can be defined as a set of respondents selected from a larger population for the purpose of the study.

The sample consisted of one National school, three County schools and four Sub-County schools selected from a total of thirty-eight public secondary schools in Bungoma East Sub-County. The total sample of schools constituted 21.05 per cent of all the secondary schools in the Sub-County. The National school admits students across the country while County schools enrol students from within the County. Sub-county schools admit students from within Sub-Counties. Thirty-five Form Two students from a National school, 102 from County schools and 263 from Sub-County schools were sampled for the study. The sample size for schools was based on convenience methods where the sample is determined at the discretion of the researcher after consulting with the supervisors. On the other hand, the sample size for students was determined by the sample size calculator which provided the sample that reflected the target population as precisely as needed. It provides as well the level of precision in an existing sample.

The researcher adopted stratified random sampling. The sample is selected in such a way to ensure that certain sub-groups in the population are represented in the sample in proportion to their number. This method is appropriate when the researcher is interested
in issues related to gender, race or age disparities in the population (Kombo & Tromp, 2006). The strata used were National, County and Sub-County schools. Selection of different samples was done as follows:

**School Category**

Stratified sampling was applied. This technique was chosen since it ensured desired representation of relevant sub-groups which increases the efficiency of the population estimate (Gay, 1992). It is important to note that there were three strata of secondary schools in Kenya: National, County and Sub-County. The only National school in the Sub-County was purposively selected and the rest were put in two strata and they were selected using simple random techniques as it is the best single way of obtaining a representative sample (Gay, 1992). The name of each school was written on a small piece of paper, which was folded and placed in the containers of their respective strata. Having placed the folded papers in containers, shuffling was done and the researcher picked at random three County and four Sub-County schools.

**Mathematics Teachers**

The study employed stratified sampling to select the sample. This ensured that sub-groups were proportionately represented and accounts for the differences in sub-group characteristics (Oso & Onen, 2005). A total of forty Mathematics teachers in the sampled schools were selected for the purpose of the study. Four teachers were from a National school, ten from County schools and twenty-six from Sub-County schools.
Students

Generally, a researcher would need 30 respondents for correlation and descriptive research designs (Kombo & Tromp, 2006). A total of 400 Form Two students were purposively selected for the study. Form Two students were purposively chosen for the study since the challenge of Mathematics starts at that level when new topics in secondary schools are introduced. Form One students had just graduated from primary schools and could not give a true picture of performance in Mathematics in secondary schools. The Form One Mathematics syllabus is usually a review of primary syllabus. Form Four students were not used in the study since they were considered too busy preparing for the national examinations which were scheduled to start in a month’s time. Form Three students were not used due to the fact that they were next in the line to sit for national examinations and therefore to a certain extent were busy.

The sample of students was selected by simple random sampling technique. Thirty-five Form Two students from a National school, one hundred and two from County schools and two hundred sixty three from Sub-County schools were sampled for the study. The streams of Form Two students in the schools of study were noted by writing on separate pieces of paper and put in a container. The required streams were then picked randomly from the container. The streams chosen formed the respondents as shown in Table 3.3.
### Table 3.3: Sample Size: Schools and Class Streams

<table>
<thead>
<tr>
<th>School Stratum</th>
<th>Number of Schools</th>
<th>Form Two Students</th>
<th>Sample Schools</th>
<th>Sample Streams</th>
<th>Students Selected for Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>National</td>
<td>1</td>
<td>324</td>
<td>1</td>
<td>1</td>
<td>35 (10.8%)</td>
</tr>
<tr>
<td>County</td>
<td>8</td>
<td>928</td>
<td>3</td>
<td>3</td>
<td>102 (10.99%)</td>
</tr>
<tr>
<td>Sub-county</td>
<td>29</td>
<td>2402</td>
<td>4</td>
<td>4</td>
<td>263 (10.9%)</td>
</tr>
</tbody>
</table>

#### 3.6 Data Collection Instruments

The study used two sets of instruments

(a) Students tests of attainment or Performance (Appendix 1)

(b) Teachers and students questionnaires (Appendix 1)

The instruments were preferred because they are the best data collecting tools of survey in an educational survey (Cohen & Manion, 2011). Questionnaires are more efficient in that the information can be collected from a large sample and diverse regions and require less time to administer (Gay, 1992).
Construction of Research Instruments

Students' English language Competence Test

This consisted of fifteen items to test the competence of Form Two students in English grammar. Most items were adapted from Kenya National Examinations Council in consultation with teachers of English language to improve on the validity. The test items were piloted in the schools which were not included in the study sample and modified to improve their validity and reliability coefficients to at least 0.70. Items with validity and reliability coefficients of at least 0.70 are accepted as valid and reliable in research (Oso & Onen, 2009). The same teachers assisted the researcher in making the marking scheme. Students indicated their gender as a way of determining the relationship between students' gender and English language competence in understanding Mathematics concepts.

Students' Mathematics Word Problem Test

This consisted of five multiple choice questions adapted from the Kenya National Examinations Council in order to improve validity. It was an achievement test aimed at determining the performance of secondary school students in word problems in Mathematics. In questions one, two and five mathematical terminologies like twice as much, polygon and profit were applied. In question three, ordinary English words like price, bought, total and find were used while in questions four and five the words like commission and regular which have a dual meaning were applied. This was done to
establish students’ English language competence in relation to understanding Mathematics problems.

**Students’ Mathematics Non-word Problem Test**

This consisted of five multiple choice questions adapted from the Kenya National Examinations Council. It is equivalent to the word problem test and had to take same time as word problem test. This was done to determine influence of students’ English language competence on performance in Mathematics.

**Mathematics Teachers Questionnaire**

It was used to find out from teachers if English language competence plays a role in Mathematics achievement. This also provided information on related barriers in learning and strategies for improving Mathematics performance.

**3.7 Pilot Study**

The study took place in Bungoma East Sub-County. It was done to test and ascertain the validity and reliability of the research instruments. A pilot study was conducted in four different schools not among those that had been selected randomly for the actual study.

Forty Form Two students were randomly selected to sit for the tests. Twenty students were from county schools while the other twenty were from Sub-county schools. On the other hand, four Mathematics teachers were randomly selected from the pilot schools to fill the questionnaire. Thus from each sampled school, one teacher had to fill the
questionnaire. Those sampled for pilot study were not involved in the actual study. This process was necessary to ensure that the instruments used were effective. Time allocated for students’ test items and questionnaires were considered. After analysis, adjustments on the students’ test items and teachers’ questionnaires were made.

### 3.7.1 Validity

Validity of research instrument is the degree to which it measures what is intended by the researcher (Orodho, 2003). To establish content validity, most of the Form Two students’ test items were adapted from the Kenya National Examinations Council past papers. Other test items were adapted from textbooks approved by the Ministry of Education in Kenya. In addition, content validity index (CVI) was computed. Six experts were asked to rate the relevance of each item based on a 4-point scale: 1= not relevant, 2= somewhat relevant, 3= quite relevant, 4= highly relevant. Then, for each item CVI was computed as the number of experts giving a rating either 3 or 4 divided by the number of experts- that is the proportion in agreement about relevance. An average for all the test items was computed and found the index as 0.86. This was above the index of 0.70 which is considered the minimum for a test to be valid.

### 3.7.2 Reliability

It was through a test-retest of the research instruments. The same test was given to the respondents on two separate occasions. The scores were then correlated using the Statistical Package for Social Sciences (SPSS). The Pearson Correlation coefficient
obtained was 0.79. This confirmed that the instruments were reliable. In addition, the reliability coefficient was determined by Kuder-Richardson Formula for estimates.

The formula for Kuder-Richardson (KR-20) used is:

$$r = \frac{k}{k-1} \left( 1 - \frac{\sum_{i=1}^{k} p_i q_i}{\sigma^2 X} \right)$$

Where K is the test items numbered i=1 to K and p_i is the proportion of correct responses to test items I, q_i is the proportion of incorrect responses to test items i (so that p_i + q_i = 1). This implies that p_i represents the percentage of respondents who got correct answer for each test item while q_i is the percentage of respondents who got wrong answer for each test item.

\(\sigma^2 X\) is the variance of the scores of sample size.

From the forty students who did the test, the test items k= 25, \(\sum p_i q_i = 1.985\) and variance =15.5475

$$R = \frac{25}{24} \left[ 1 - \frac{1.985}{15.5475} \right]$$

= 0.9063

This implies the test items could be relied on since the reliability coefficient was quite high.
3.8 Data Collection Techniques

Students' tests of attainment and questionnaires were the main tools for data collection. The selection of these tools was guided by the nature of data which were collected, time available and the objectives of the study. The target population was largely literate and were unlikely to have difficulties responding to questionnaire items. The study was concerned with thirty-eight secondary schools in Bungoma East Sub-County. The researcher applied stratified random sampling which ensured that certain sub-groups were represented in proportion to their number. This involved dividing the population and taking a simple random sample from each subgroup. Eight secondary schools were selected for the study. One National school, three County schools and four Sub-County schools were used. Table 3.4 shows the distribution of students in eight sampled schools in Bungoma East Sub-County.

Table 3.4: Distribution of students in eight sampled schools in Bungoma East Sub-County

<table>
<thead>
<tr>
<th>School Category</th>
<th>Number of Schools</th>
<th>Number of Two students selected</th>
<th>Percentage of Two students selected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sub-county</td>
<td>4</td>
<td>263</td>
<td>65.75</td>
</tr>
<tr>
<td>County</td>
<td>3</td>
<td>102</td>
<td>25.50</td>
</tr>
<tr>
<td>National</td>
<td>1</td>
<td>35</td>
<td>8.75</td>
</tr>
<tr>
<td>Total</td>
<td>8</td>
<td>400</td>
<td>100</td>
</tr>
</tbody>
</table>
The researcher ensured that selected schools for the study were not biased on gender. Therefore, the ratio of girls, boys and mixed schools was about 1:1:1. This applied to Sub-County and County schools only. The only National school in Bungoma East sub-county was purposively selected for the study. A total of 400 Form Two students were involved in the study. Two hundred and sixty three from Sub-County schools, one hundred and two from County schools and thirty-five from the National school. The tests were administered within the specified time, papers collected and marked as per the marking schemes in the appendices. During data collection, the researcher encountered some challenges which were addressed in order to have a successful study. The return rate for Mathematics teachers was one hundred per cent. Thus, all the sampled forty teachers filled the questionnaire. Some nine students (2.25 %) out of the four hundred students sampled for study did not remit their test item results. The researcher had to conduct several follow-ups on the research assistants and respondents which yielded better results. In addition, the researcher would stay around to oversee the exercise himself. There were also a few cases of some respondents who failed to answer some questions. However, since the questionnaires had similar items to be responded to, the researcher had to interpolate by analyzing how similar respondents had answered. This provided answers to questions not responded to.

3.9 Data Analysis

Students' English language and Mathematics competence tests were administered. The Mathematics tests were in two categories: word and non-word. The data obtained from
students' tests were both qualitative and quantitative. On the other hand, Mathematics
teachers questionnaire provided qualitative data. The questionnaires were serialized and
10 per cent were randomly selected to prepare the code dictionary which is the definition
of codes as used in research. A code sheet was prepared and 10 per cent of the
questionnaires were coded on the code sheet. The code dictionary was modified in the
light of what was observed—the data collected were cleaned to remove any errors made
during data entry. All the questionnaires were coded and its data entered into Statistical
Package for Social Sciences (SPSS) for analysis. The statistics derived involved
percentages, mean and standard deviation. Qualitative data were analyzed thematically.
Kombo and Tromp (2006) point out that in using this form of analysis, major concepts or
themes are identified from the data which are relevant to the research questions and
objectives. A coding system was developed based on samples of collected data and
classified major issues. The coded materials were then placed under major topics
identified and graphics were used to present the findings. Frequency distribution tables
and bar charts were used whose discussion was mainly based on descriptive and
inferential statistics. It considered inferences from the opinion of teachers. The three key
variables in data analysis were the student, teacher and school.

Analysis of scores in Mathematics word and non-word problem tests was done using
student t-test by SPSS computer programme. Student “t” test was used to measure the
difference between students Mathematics mean scores in word problem and non-word
problem tests. Pearson Product Moment correlation coefficient was used to measure the
degree of association between students’ total scores in English language and Mathematics competence tests.

3.10 Logistical and Ethical Considerations

Permission to have the research undertaken was sought from the Ministry of Education headquarters and Sub-County Education Office. During the first visit to schools, headteachers were requested to have research undertaken in their schools. The researcher explained to them the intention of conducting a study in their schools. They were informed that Mathematics teachers and some students were to be involved in the study. In the second visit to every school, questionnaires were distributed to respondents. There was an explanation on how they were to be filled. The researcher assured the respondents that the information they provided was to be treated with strict confidentiality.
CHAPTER FOUR

DATA PRESENTATION, ANALYSIS, INTERPRETATION AND DISCUSSION

4.1 Preamble

This chapter provides data presentation, analysis and interpretation of results according to the order of research objectives stated. The purpose of the study was to determine the learners’ English language competence with a view to improving the performance in Mathematics in Bungoma East Sub-County.

4.2 Students’ English Language Competence in Relation to Understanding Mathematics Problems

The first task of the study was to establish students’ English language competence in relation to understanding Mathematics problems. Word and non-word problem tests in Mathematics were administered to the students sampled for the study. In each test, five multiple choice questions were given to the respondents. Each question was assigned three marks, therefore, for every test a maximum of 15 marks was awarded. Since the two tests were equivalent, time allocated for each was the same. To avoid duplication of answers, the tests were done on separate days. The answers for the two tests were the same. The researcher marked the test items as per the marking schemes and the scores were entered into SPSS computer programme. The scores for word and non-word problem tests per school category were as shown in Table 4.1.
Table 4.1: Scores for Mathematics Word and Non-word Problem Tests

<table>
<thead>
<tr>
<th>School category</th>
<th>Number of Form Two sampled students</th>
<th>Mean score for word problem test</th>
<th>Mean score for non-word problem test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sub-County</td>
<td>263</td>
<td>8.32</td>
<td>11.66</td>
</tr>
<tr>
<td>County</td>
<td>102</td>
<td>7.76</td>
<td>11.41</td>
</tr>
<tr>
<td>National</td>
<td>35</td>
<td>11.83</td>
<td>13.46</td>
</tr>
<tr>
<td>Total</td>
<td>400</td>
<td>8.48</td>
<td>11.75</td>
</tr>
</tbody>
</table>

A total of 400 Form Two students were used in the study. Two hundred and sixty three were from Sub-County schools, one hundred and two from County schools while thirty-five were from the National school. From Table 4.1, it was observed that the only National school in Bungoma East Sub-County had the highest mean score in both word and non-word problem tests. Sub-County schools had the second highest mean scores while County schools had the lowest. It can be deduced that for every category of school, students scored higher marks in non-word problem test compared to word problem test. Use of words in Mathematics seems to pose a challenge to learners. Words used like price, total, find and bought are from ordinary English language which is a second language, therefore, causes a challenge in understanding Mathematics problems. There is also the special mathematical language where certain words like twice as much, polygon and profit are used in Mathematics only. Learners may not comprehend such words when used in problem solving. On the other hand, there are some words like regular and
commission used in Mathematics which have a different meaning altogether if used in another context. Students performed better in questions where ordinary English was applied compared to the case of use of special mathematical language. In question three, ordinary English was used and 288 (72 Per cent) got it right. In question five special mathematical terminologies were used and only 164 (41 per cent) got it right. This was in agreement with Njeru (2010) who found a strong positive correlation between students’ English language competence in solving word problems and Mathematics performance. The study recommended a lot of emphasis on teaching English language by both teachers of English and Mathematics in order to improve the performance in Mathematics.

The second task focused on confirmation from teachers whether students experienced difficulties in learning Mathematics concepts due to lack of English language competence, this being the language of instruction. Forty teachers who were randomly selected filled the questionnaire. They indicated their responses as either Yes or No. Data collected were qualitative, therefore the researcher analyzed thematically. A coding system was developed based on the two possible responses and the results were as shown in Figure 4.1.
The study indicated that four fifths (32) of the teachers acknowledged the fact that students experience difficulties in learning Mathematics using English as the language of instruction. Only a fifth (8) of the teachers had a contrary opinion. Teachers who affirmed that teaching Mathematics using English language poses a challenge had the following reasons:

(a) Many students fail to interpret instructions and questions which are in English language

(b) Learners have mother tongue influence that interferes with mastery of English language
(c) Some words like commission and regular used in Mathematics have a dual meaning. They do not have the same meaning when applied in Mathematics and ordinary English.

(d) Some teachers are not competent enough to teach Mathematics using English language. The weakness experienced by such teachers is also transferred to the learners. This implies that the students' English competence is hampered leading to poor performance in mathematics.

From the study, it was clear that teachers think that English language poses a challenge in the teaching and learning of Mathematics in secondary schools.

The third task required teachers to indicate the English language words used in Mathematics that they found difficult to explain to the learners and those which students found difficult. All the respondents who filled the questionnaire identified some of the words which include: prove, loci, root, integrate, evaluate and magnitude. The list had words like subtends, vector, magnitude, evaluate, differentiate, integrate, roots, prove and factorize. It was observed generally that words used in Mathematics that teachers find difficult to explain were the same as those learners find difficult. Many of these words like loci and subtends are applied in Mathematics only; therefore, they pose a challenge in learning process. As indicated in Table 4.1, all the 400 Form Two students sampled for study had a mean score of 8.48 in word problem test compared to a mean score of 11.75 in non-word problem test. The relatively lower mean score in word-problem test could be attributed to failure by learners to understand ordinary English language which
is a second language to many students. The special terminologies in Mathematics like *twice as much, profit, regular and commission* which were used in students’ Mathematics competence test are also a contributory factor. This finding was in agreement with Njeru (2010) who found that students experience difficulties in learning Mathematics due to wrong interpretation of word problems as some words carry a different meaning when used in ordinary English language.

4.3 Influence of Students’ English language Competence on Performance in Mathematics

4.3.1 Students’ English language Competence

The study sought to determine the influence of students’ English language competence on performance in Mathematics. A test was administered to 400 Form Two students in Bungoma East Sub-County. Each student was to answer fifteen questions as per instructions given. For every correct answer, two marks were awarded. Thus a maximum of thirty marks was awarded. The mean scores and standard deviation were obtained from SPSS computer programme and were summarized as shown in Table 4.2.

Table 4.2: Mean and standard deviation on students’ English competence test

<table>
<thead>
<tr>
<th>School category</th>
<th>Mean score</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sub-county</td>
<td>12.23</td>
<td>3.80</td>
</tr>
<tr>
<td>County</td>
<td>12.98</td>
<td>5.72</td>
</tr>
<tr>
<td>National</td>
<td>20.50</td>
<td>3.92</td>
</tr>
</tbody>
</table>
From Table 4.2, the National schools had the highest mean score of 20.51 out of a maximum of 30 while Sub-County schools had the lowest mean score of 12.23. The mean scores reflect what would be expected under normal circumstances since National schools select pupils from primary schools with highest Kenya Certificate of Primary of Education (KCPE) marks. This is followed by County and Sub-County schools respectively. Table 4.2 indicates that Sub-County schools had the lowest standard deviation while County schools had the highest. Since Sub-County schools had the lowest standard deviation, it implied that most of the scores were closely spread around the mean. Most students in Sub-County schools are from the communities around the schools and are day scholars. This could encourage use of “mother tongue” that lowers English language competence.

4.3.2 Students' English language Competence on Mathematics Performance

In correlational research studies, data is mainly analyzed using correlational coefficient and one such tool is Pearson Correlation Coefficient (Kombo and Tromp, 2006). By using this tool the researcher indicates the degree of association between two variables. The correlation coefficient is a number ranging from 1 (a perfect positive correlation) through 0 (no relationship between variables) to -1 (a perfect negative correlation). The correlation coefficient attempts to indicate the proportion of sameness between two variables. The students’ English and Mathematics competence scores were correlated using SPSS computer programme. The results were summarized in Table 4.3.
Table 4.3: Influence of Students’ English language Competence on Performance in Mathematics

<table>
<thead>
<tr>
<th>English competence</th>
<th>Mathematics competence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson correlation</td>
<td>1</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>0.9649</td>
</tr>
</tbody>
</table>

N = 400

The correlation is significant at 0.05 level (2-tailed). Pearson correlation coefficient, $r = 0.9649$ and $\alpha = 0.05$.

From Table 4.3, it was observed that $r = 0.9649$ indicates a strong positive relationship. The proportion of sameness between English language competence and Mathematics performance is 96.49%. This implies that a learner who is competent in English language is likely to perform well in Mathematics. In the past students and teachers have assumed the importance of English language in learning Mathematics. Njeru (2010) recommended a lot of emphasis on teaching English language to students by both Mathematics and teachers of English in order to boost the performance in Mathematics. This was supported
by Manyara (2011) who points out that students should be encouraged to speak English regularly to improve mastery of language in order to improve the performance in Mathematics.

4.3.3'Comparison of Students’ Performance in Mathematics Word and Non-word Problem Tests

A student t-test was carried out using SPSS computer programme to measure the difference between students’ Mathematics mean scores in word problem and non-word problem tests. The results were as in Table 4.4.

Table 4.4: Student t-test in Mathematics Word and Non-word Tests

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean Score</th>
<th>Standard deviation</th>
<th>Standard error deviation</th>
<th>Mean difference</th>
<th>t-value</th>
<th>Degrees of freedom</th>
<th>2-tail significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Word</td>
<td>400</td>
<td>8.48</td>
<td>0.12</td>
<td>0.135</td>
<td>-3.27</td>
<td>24.1636</td>
<td>399</td>
<td>0.05</td>
</tr>
<tr>
<td>Non-word</td>
<td>400</td>
<td>11.75</td>
<td>0.16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

DF- Degrees of Freedom    Sig. – Significance

From Table 4.4, it was deduced that students performed better in non-word problem test compared to word problem test. Word problem test had a mean score of 8.48 while non-word problem test had 11.75. It was also observed that $t(400) = 24.1636$ were extremely statistically significant at $\alpha=0.05$, 2-tailed for word and non-word Mathematics
competence tests. The difference in the mean score for word and non-word problem tests was very high. This implied that students performed far much better in non-word problem test compared to word problem test. The implication is that word problems in Mathematics pose a challenge to students.

4.4 Relationship Between Students' Gender and English Language Competence in Understanding Mathematics Concepts

The third objective of the study was to determine the relationship between students' gender and English language competence in understanding Mathematics concepts. Some 193 Form Two boys and 207 girls were selected by simple random sampling technique to sit for English and Mathematics competence tests. The number of boys and girls was in the ratio of their proportion in Bungoma East Sub-County. In the students test items, each student was required to indicate the gender by ticking appropriately. The researcher marked the tests and the scores obtained were analyzed using SPSS computer programme. The results were as indicated in Table 4.5 and 4.6.
Table 4.5: English language Competence Mean Scores as per Gender

<table>
<thead>
<tr>
<th>Gender</th>
<th>Number of sampled Form Two students</th>
<th>Mean score (out of maximum 30)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys</td>
<td>193</td>
<td>12.53</td>
</tr>
<tr>
<td>Girls</td>
<td>207</td>
<td>13.66</td>
</tr>
</tbody>
</table>

Table 4.5 indicates that more girls than boys were selected for the English language competence test since they were more than boys in the Sub-County and County schools. Overall, there were more girls than boys in Bungoma East Sub-County secondary schools. This was in agreement with the known trends in the country where some counties are presenting more female candidates compared to male candidates. While releasing KCSE results for 2014, the cabinet secretary for Education in Kenya said, “despite the number of male candidates who sat for the examination being higher than that of female candidates since the inception of the examination, candidature trends indicate that the percentage increase of female candidates has been higher than that of male candidates in the past three years” (The Daily Nation, 4th March 2015). Girls performed better than boys in English language competence test. Girls had a mean score of 13.66 compared to boys who had 12.53. This finding concurs with trends in KCSE in which girls have often performed better than boys in English language. Overall, the students mean scores were below average in English language as usually depicted in KCSE results in the Sub-County. This concurs with Abiri (2013) who found that the
major challenges facing students in learning English are frequent use of mother tongue by students, uncooperative teachers and misunderstanding of concepts like grammar, spelling and poor writing skills. The mean scores for Mathematics test by gender are indicated in Table 4.6.

Table 4.6: Performance in Mathematics by Gender

<table>
<thead>
<tr>
<th>Gender</th>
<th>Number of sampled Form Two students</th>
<th>Mean score (out of maximum 30)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys</td>
<td>193</td>
<td>20.84</td>
</tr>
<tr>
<td>Girls</td>
<td>207</td>
<td>19.30</td>
</tr>
</tbody>
</table>

Boys performed slightly better than girls in Mathematics competence test as indicated in Table 4.6. The difference in mean scores was statistically not significant. Boys had a mean score of 20.84 compared to girls mean score of 19.30. This was in agreement with Mwangi (1986) who found that sex of the students is significantly related to performance in Mathematics in favour of the boys. Rauta (2013) found that boys performed better than girls in Mathematics. However, Njeru (2010) found that girls performed better than boys in the same subject. On the overall, it was expected that girls perform better than boys in Mathematics competence test since they had done better in English competence test. The mean scores for Mathematics for both gender were relatively higher than the
mean scores for English language. This was contrary to known trends in KCSE results in which mean scores for English language are lower than those of Mathematics.

4.5 Strategies for Improving Mathematics Performance

The fourth objective of the study was to establish strategies that would improve performance in Mathematics in Bungoma East Sub-County. Forty Mathematics teachers in the schools sampled for the study were randomly selected and filled the questionnaire. Four teachers were from the National school, ten from County schools and twenty six from Sub-County schools. They stated in the questionnaire the effect of students’ English competence on Mathematics performance. They also cited other barriers to learning Mathematics and suggested strategies for improving performance in Mathematics. The data collected were qualitative, hence, analyzed thematically. Barriers which featured include: negative attitude of learners towards Mathematic, lack of role models, lack of relevant Mathematics text books and poor teaching methods. The data collected were as in Table 4.7.
Table 4.7: Barriers to learning Mathematics

<table>
<thead>
<tr>
<th>Barrier</th>
<th>Number of teachers citing barrier</th>
<th>Percentage of teachers citing barrier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative attitude</td>
<td>30</td>
<td>75</td>
</tr>
<tr>
<td>Lack of relevant textbooks</td>
<td>28</td>
<td>70</td>
</tr>
<tr>
<td>Poor teaching methods</td>
<td>27</td>
<td>67.5</td>
</tr>
<tr>
<td>Other barriers e.g lack of role models</td>
<td>11</td>
<td>27.5</td>
</tr>
</tbody>
</table>

Table 4.7 shows that 30 (75%) of the teachers cited negative attitude of students as a barrier to learning Mathematics while 27 (67.5%) mentioned poor teaching methods as a contributor to low achievement in the subject. Twenty eight (70%) cited lack of relevant textbooks and other barriers like lack of role models were mentioned by 11 (27.5%) of the teachers. The data revealed that teachers in Bungoma East Sub-County think that the major barriers to learning Mathematics include negative attitude by students, lack of relevant textbooks and poor teaching methods. Forty Mathematics teachers in the selected schools for the study filled the questionnaires. They were required to indicate gender by ticking appropriately and provide information on their academic qualification. The results are shown in Table 4.8.
Table 4.8: Teachers Gender and Academic Qualification

<table>
<thead>
<tr>
<th>Gender</th>
<th>Academic Qualification</th>
<th>Number of Teachers</th>
</tr>
</thead>
<tbody>
<tr>
<td>male</td>
<td>M.Ed</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>B.Ed</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>Dip.Ed</td>
<td>6</td>
</tr>
<tr>
<td>Female</td>
<td>M.Ed</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>B.Ed</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Dip.Ed</td>
<td>2</td>
</tr>
</tbody>
</table>

Overall, out of forty sampled teachers for the study thirty two (80%) had a Bachelors Degree in Education. The rest of the teachers were trained with a Diploma in Education. This shows that the Sub-County had teachers who were highly qualified as recommended by the Ministry of Education. The academic qualification of teachers directly affects teaching and learning of Mathematics since those qualified are bound to use the right methods to teach Mathematics. This argument concurs with Wayne and Young (2000) who found that secondary school students learn more Mathematics from teachers with degrees or significant course work in the subject. The female teachers were only 10 (25%) of the sampled teacher, indicating that there are fewer female teachers of Mathematics in the Sub-County. The small number of female Mathematics teachers in
Bungoma East Sub-County could be attributing to girls’ lower achievement in the subject as indicated in Table 4.8. Female teachers are to act as role models to girls in the subject.

4.5.1 Attitude of Learners Towards Mathematics

As indicated in Table 4.7, three-quarters of the teachers in Bungoma East Sub-County cited negative attitude towards Mathematics as a major factor contributing to low achievement in the subject. This agrees with Mwamwenda (1995) who argued that the achievement of students in a subject is determined by their attitudes rather than inability to study. This is also supported by Mulupi (2011) who cited students’ attitudes as the main challenge facing the learning of Mathematics in secondary schools. Even if the studies carried out were not in Bungoma East Sub-County, they were applicable globally just like SMASSE programme which was initiated in Japan but is applied in Kenya. Teachers, parents and other stakeholders in education should look for ways of making learners develop a positive attitude towards Mathematics in order to improve the results.

4.5.2 Provision and Adequacy of Mathematics Teaching Resources

In the teachers’ questionnaire, there was an item which sought views on provision and adequacy of Mathematics resources. Thirty-eight out of forty (95%) were of the view that resources are provided in schools, however, thirty-six out of the same number (94.74%) felt that the resources were not adequate. Forty Mathematics teachers who were randomly selected to fill the questionnaire listed three Mathematics textbooks which they used in class in order of preference. They were also to state the criteria for choosing
those textbooks. Data collected were qualitative, therefore analyzed thematically. The findings were as indicated in Table 4.9.

Table 4.9: Teachers Selection of Mathematics Textbooks in order of Preference

<table>
<thead>
<tr>
<th>Criteria for selection</th>
<th>Numbers of teachers</th>
<th>Percentage of teachers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Textbook using simple English</td>
<td>21</td>
<td>52.5</td>
</tr>
<tr>
<td>Relevant to syllabus</td>
<td>12</td>
<td>30</td>
</tr>
<tr>
<td>Availability and cost</td>
<td>3</td>
<td>7.5</td>
</tr>
<tr>
<td>Others e.g. physical appearance</td>
<td>4</td>
<td>10</td>
</tr>
</tbody>
</table>

Table 4.9 indicates that 21 (52.5%) of the sampled teachers in Bungoma East Sub-County think that selecting Mathematics textbooks based on simple English is a key criterion. Twelve (30%) of the teachers considered relevance to syllabuses while 3 (7.5%) mentioned availability and cost. Other factors such as physical appearance of the book were considered by four teachers (10%). The implication is that majority of teachers in Bungoma East Sub-County consider Mathematics textbooks that use simple English language. These findings imply that teachers should assist students to make choices of textbooks that are relevant in the learning process. The textbooks should use simple English language to improve the reading ability of the student which enhances
understanding of Mathematics concepts. This concurs with Psacharopolous and Woodhall (1995) who observed that availability and quality of textbooks in a secondary school is strongly related to achievement.

4.5.3 Teaching Methods in Mathematics

In the teachers’ questionnaire, three methods which were frequently used for teaching Mathematics were to be stated. The results were as shown in Table 4.10.
Table 4.10: Instructional Methods used by Teachers of Mathematics

<table>
<thead>
<tr>
<th>Instructional Method</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Question and Answer</td>
<td>38</td>
<td>31.67</td>
</tr>
<tr>
<td>Lecture</td>
<td>21</td>
<td>17.50</td>
</tr>
<tr>
<td>Demonstration</td>
<td>24</td>
<td>20.00</td>
</tr>
<tr>
<td>Discussion</td>
<td>33</td>
<td>27.50</td>
</tr>
<tr>
<td>Problem solving/Project</td>
<td>3</td>
<td>2.50</td>
</tr>
<tr>
<td>Experiment</td>
<td>1</td>
<td>0.83</td>
</tr>
<tr>
<td>Co-operative learning</td>
<td>0</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Table 4.10 indicates that most teachers use Question and answer (31.67 %), discussion (27.5 %) and Demonstration (20.0 %) methods in teaching Mathematics. A good proportion (17.7 %) use lecture method while student-centred methods like problem solving, experiment and co-operative learning were rarely used. Teachers think the methods used in teaching Mathematics in Bungoma East Sub-County are not appropriate. For example, lecture method keeps many learners in a passive mode, therefore, not effective for higher cognitive learning. Costello (1991) puts it that lecture method is ineffective as it turns the learners into passive participants in the teaching process. It is
important that Mathematics teachers use modern methods of teaching like problem solving, project, discovery and small group co-operative to enhance learning. Integration of Information Communication Technology (ICT) in teaching Mathematics improves learning of the subject. Therefore appropriate method should be used as a strategy to enhance learning of Mathematics.

The other barriers of learning Mathematics which were cited by teachers are:

(a) Wide syllabus that leads to teachers rushing through in order to have it covered in time

(b) Low entry behaviour of students especially in Sub-County schools

(c) Chronic absenteeism of students in some schools which leads to lack of continuity in the learning process. Missing some concepts in Mathematics may lead to a spill over; therefore, a student may not grasp similar ones that may come in future.

The study sought to find out strategies that would improve performance in Mathematics in Bungoma East Sub-County schools. The following solutions were proposed by teachers:

(i) Regular assessment tests that would improve English language competence

(ii) Regular refresher courses and workshops for teachers to improve their delivery skills in the classroom
(iii) Provision of adequate teaching resources like textbooks which encourages continuous learning of the students in and out of class

(iv) Provision of career counseling services to students to enable them realize the importance of the subject.

(v) Parents should be involved in stressing the need for learning and getting good grades in Mathematics.

(vi) Teachers should use simple English language to instruct students and explain appropriately mathematical terminologies which are derived from English language.

(vii) Integration of ICT in the teaching of Mathematics. For example, use of simulations makes the learning of Mathematics real and interesting.
CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Preamble

This chapter presents a summary of research findings, conclusions, recommendations and suggestions for further research. The purpose of the study was to determine the learners’ English language competence with a view to improving the performance in Mathematics.

5.2 Summary of the Study

The study was about influence of learners’ English language competence on Mathematics achievement with a view to improving the performance in secondary schools in Bungoma East Sub-County. The study was based on the theory that language is the basis of our thought processes (Bruner, 1966). This was supported by the relativity theory which states that the structure of one’s language affects his/her thought processes. The study employed descriptive survey design. Stratified random sampling was applied in selecting forty teachers and four hundred students in the study. Students’ English and Mathematics competence tests of attainment or performance and questionnaires were used to collect data. Students’ tests and teachers’ questionnaires were both qualitative and quantitative which was presented in tabular and graphical forms. Analysis of quantitative data was done using SPSS computer programme while qualitative data was analyzed thematically. Frequency distribution tables and bar charts were used whose discussion was based on descriptive and inferential statistics. Means, percentages and standard deviations...
provided descriptive analysis while student ‘t’ test and Pearson correlation coefficient were used to draw inferences of the findings.

5.3 Summary of the Findings

The first objective of the study was to establish students’ English language competence in relation to understanding Mathematics problems. Analysis of data revealed that students experience English language challenges in understanding Mathematics problems. The study found that majority of the students have a challenge of English language as reflected by the mean scores of the English language competence test, particularly in County and Sub-County schools. In these types of schools, the mean scores were below 50 per cent. Therefore, it is important that English language competence of learners is considered as a way of improving the performance in Mathematics in secondary schools.

The second objective was to determine the influence of students’ English language competence on performance in mathematics. Data analysis and interpretation indicated that there is a significant relationship between English competence and Mathematics performance. Hence, English language competence of learners should be considered while addressing the performance in Mathematics.

The third objective was to determine the relationship between students’ gender and English language competence in understanding Mathematics concepts. Data analysis and interpretation indicated that there is a relationship between gender and students’ English
language competence in understanding Mathematics concepts. Therefore gender is a key factor to be considered while trying to improve the performance in Mathematics.

The fourth objective was to establish strategies to improve performance in Mathematics in Bungoma East Sub-County secondary schools. Data analysis and interpretation revealed that use of simple English language, appropriate teaching methods and use of relevant textbooks were the key strategies which should be used.

5.4 Conclusions

The study investigated English language competence and Mathematics performance among secondary school students in Bungoma East Sub-County. It intended to improve the performance in Mathematics, given that there was poor performance in the subject. The study established that students experience English language challenges in understanding Mathematics problems in Bungoma East Sub-County. There was a strong relationship between students' English language competence and performance in Mathematics. Those students who are competent in English language are likely to perform better in Mathematics. Gender was found to be a key factor while dealing with students' English language competence in understanding Mathematics problems. Girls experience more English language problems in understanding Mathematics concepts. This was due to the fact that boys performed slightly better than girls in Mathematics competence test. The key strategies for improving performance in Mathematics include: use of simple English language, relevant textbooks and appropriate teaching methods. In
view of these findings, the study concludes that to address the performance in Mathematics, English language competence of learners should be considered.

5.5 Recommendations of the Study

This section provides recommendations based on existing policy that needs enhancement and non-existent policy which needs to be formulated.

5.5.1 Policy Recommendations

(i) The study established that students experience English language problems in understanding Mathematics problems. They performed better in Mathematics non-word problem test compared to word problem test. Eighty per cent of teachers acknowledge that students have difficulties in learning Mathematics using English language. It is recommended that teachers use simple English language while teaching Mathematics. In addition, the Kenya National Examinations Council should use appropriate English language in test items to boost performance in Mathematics.

(ii) The study found that there are words in Mathematics that students find difficult to explain. On the other hand, there are words that the students find difficult to understand. To overcome this problem, curriculum developers should introduce a Mathematics dictionary to assist both teachers and learners.

(iii) The study established that girls experience more English language challenges than boys in understanding Mathematics problems. The study found that only twenty five per
cent of the secondary school Mathematics teachers are female. It also revealed that girls have a more pronounced negative attitude towards Mathematics learning and stereotypes that the subject is a male domain. It is therefore recommended that the Ministry of Education in Kenya finds ways to increase the number of female teachers so that they act as role models to boost the performance of girls in Mathematics.

(iv) The study found a strong positive correlation \( r = 0.9649 \) between students' English language competence and Mathematics competence. Assessment of students' English competence is relevant in learning Mathematics. It is therefore recommended that teachers of Mathematics and English should stress the importance of learning English language as a way of improving performance in mathematics in the Sub-County.

(v) The study established that barriers to learning Mathematics include: negative attitude by students, lack of relevant textbooks and poor teaching methods. It is therefore recommended that quality assurance and standard officers organize regular refresher courses and workshops for teachers, in order to enable them to keep abreast with the current and most effective ways of teaching the subject.

(vi) Twenty one teachers out of forty (52.5%) cited simple English language as the main reason for choosing textbooks. It is therefore recommended that textbooks authors write books with simple English language to improve learning of Mathematics.

(vii) The study established strategies to improve performance in Mathematics as follows:
- Teachers to provide regular assessment tests that would improve English language competence of learners

- The Ministry of Education in Kenya to provide adequate resources like textbooks which encourages continuous learning of the students in and out of class

- Teachers to provide career counseling services to students which would enable them realize the importance of the subject

5.5.2 Recommendations for Further Research

1. Since the sample respondents were drawn from one Sub-County in Kenya, it may not be a true reflection in the whole country. This study needs to be extended to other parts of a country as regards influence of English language competence on Mathematics performance.

2. A study can be conducted to find feasibility and effectiveness of providing opportunities for students to discuss Mathematics in their home language as part of the pathway to learning Mathematics in English.

3. A study can be carried out to determine the effects of multilingualism in Mathematics learning especially in urban schools in Kenya

4. A study can be conducted to determine if teachers attributions of English language proficiency influence students achievement in Mathematics.
REFERENCES


Wyne, A. and Young, P. (2003). *Teacher's characteristics and Pupils' Achievement: A review of Educational research*
APPENDIX I

RESEARCH INSTRUMENTS

SECTION A: STUDENTS’ QUESTIONNAIRE

The study is designed to determine influence of students’ English language competence on performance in Mathematics. The information you provide will be accepted with confidentiality. It will be used only for the study and in no way against you.

Students’ English Language Proficiency Test


STUDENTS’ PERSONAL INFORMATION

Name of school_________________________ Form____________________

Gender  Boy ( )  Girl ( ) Tick where appropriate

STUDENTS’ ENGLISH LANGUAGE COMPETENCE TEST  TIME: 30 minutes

TOTAL MARKS: 30 MARKS

Instructions: For each of the following sentences, use the correct form of the word in brackets to fill in the blank space.

1. We ___________ (regular) visit our grandparents in the village.

2. The company has been ___________ for twenty years. (exist)
3. The man agreed to accompany her to the market after a lot of ________
   (persuade)

4. Once the sun ____________, I cannot sleep any more. (rise)

5. How long have you ____________ here? (dwell)

6. It is advisable that we ____________ forgive those who wrong us. (condition)

SECTION B

Complete each of the following sentences using the correct phrasal verb formed from the word given in brackets

7. The bomb ____________ at around midnight. (go)

8. You have to ____________ to her what to do. (spell)

9. Mwangi has ____________ the lights because he wants to sleep. (turn)

SECTION C

Select by circling the best of the four choices given to complete the following sentences

10. It was a terrible match, and our team were ____________ by four goals to nil.
   (A) beaten (B) Won (C) conquered (D) bitten

11. Peter put the work aside when he went to lunch, with ____________ it up again the afternoon.
(A) an intention to take (B) an intention of taking (C) the intention of taking (D) the intention to take.

12. This is a wonderful ________, it can print ten thousand copies of a book in about two hours.

(A) instrument (B) implement (c) Machinery (D) Machine

13. It was with my brothers when thieves attacked the

house, ____________ were able to overpower them quite easily.

(A) we three people (B) the three of us (C) us three (D) all three

14. He believes in ghosts, but I am convinced there is no ________ as a ghost.

(A) such a thing (B) such thing (C) such things (D) such

15. When I ________ their answer, I will let you know at once.

(A) have received (B) shall have received (C) will have received (D) shall receive
STUDENTS’ MATHEMATICS WORD PROBLEM TEST

TIME: 30 MINUTES

TOTAL MARKS: 15

Instructions: Answer the following five questions by circling only ONE correct answer from the choices given.

1. Wekesa sold a radio costing Ksh. 3800 at a profit of 20%. He earned a commission of \(22\frac{1}{2}\%\). Find the amount he earned.

   (A) Ksh. 760       (B) Ksh. 855    (C) Ksh. 1026     (D) Ksh. 171

2. A fuel dealer makes a profit of Kshs 520 for every 1,000 litres of petrol sold and Kshs 480 for every 1,000 litres of diesel sold. In a certain month, the dealer sold twice as much diesel as petrol. If the total fuel sold that month was 900,000 litres, find the dealer’s profit for the month.

   (A) Ksh. 444,000    (B) Ksh. 456,000  (C) Ksh. 888,000   (D) Ksh. 952,000


   (A) Ksh. 240      (B) Ksh. 200     (C) Ksh. 440       (D) Ksh. 400
4. In the month of January, an insurance salesman earned Ksh. 6750, which was a commission of 4.5% of the premium paid to the company. Calculate the premium paid to the company.

(A) Ksh. 303.75  
(B) Ksh. 15,000  
(C) Ksh. 3037.50  
(D) Ksh. 150,000

5. The size of an interior angle of a regular polygon is $6\frac{1}{2}$ times that of its exterior angle. Determine the number of sides of the polygon.

(A) 24  
(B) 15  
(C) 10  
(D) 8

STUDENTS’ MATHEMATICS NON-WORD PROBLEM TEST  
TOTALMARKS: 15MARKS  

Instructions: Answer all the following five questions by circling only ONE correct answer from the choices given.

1. Workout : $\frac{3800 \times 20 \times 22 \frac{1}{2}}{100 \times 100}$

(A) 760  
(B) 855  
(C) 1026  
(D) 171

2. Workout : $\left(\frac{320 \times 300,000}{1000}\right) + \left(\frac{480 \times 600,000}{1000}\right)$
3. What is the value of \( y \) in the equations below:

\[
\begin{align*}
5x + 6y &= 2440 \\
7x + 9y &= 3560
\end{align*}
\]

(A) 240  (B) 200  (C) 440  (D) 40

4. What is ‘\( X \)’ if: \( \frac{4.5 \times X}{100} = 6750 \)

(A) 303.75  (B) 15,000  (C) 3037.50  (D) 150,000

5. What is ‘\( N \)’ in:

\[
N = \frac{360}{\lambda} \text{ and } 6.5x + x = 180
\]

(A) 24  (B) 15  (C) 10  (D) 8
## MARKING SCHEMES

<table>
<thead>
<tr>
<th>Question Number</th>
<th>English</th>
<th>Mathematics Word</th>
<th>Mathematics Non-word</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>regularly</td>
<td>D</td>
<td>D</td>
</tr>
<tr>
<td>2</td>
<td>existence</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>3</td>
<td>persuasion</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>4</td>
<td>rises</td>
<td>D</td>
<td>D</td>
</tr>
<tr>
<td>5</td>
<td>dwelt</td>
<td>B</td>
<td>B</td>
</tr>
<tr>
<td>6</td>
<td>unconditionally</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Went off</td>
<td></td>
<td></td>
</tr>
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<td>8</td>
<td>Spell out</td>
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<td></td>
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<td>9</td>
<td>Turned off</td>
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<td>10</td>
<td>A</td>
<td></td>
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<tr>
<td>11</td>
<td>C</td>
<td></td>
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<tr>
<td>12</td>
<td>D</td>
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<tr>
<td>14</td>
<td>B</td>
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<tr>
<td>15</td>
<td>A</td>
<td></td>
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</table>
SECTION D : MATHEMATICS TEACHERS QUESTIONNAIRE

This study is being undertaken by a student from Kenyatta University. The study intends to determine the influence of students’ English language competence on performance in Mathematics in secondary schools. The results of the study will go a long way in improving the students' performance in Mathematics. The information you provide will be accepted and treated with strict confidentiality. It will be used only for the purposes of this study. You are requested to answer the following questions honestly.

Teachers Personal Information

Please tick where appropriate

(a) Gender
   Male ( )   Female ( )

(b) Academic Qualification
   (i) MEd ( )
   (ii) BEd ( )
   (iii) Dip Ed ( )
   (iv) Others

For others specify .................................................................

(c) School type where you are teaching
   National ( )   County ( )
   Sub-County ( )
Teaching Mathematics

(a) Do you have any difficulties when teaching Mathematics in English as the language of instruction? Yes ( ) No ( )

(b) Give two main reasons for the answer in (a) above

(c) Do your students experience difficulties of learning Mathematics concepts in English as the language of instruction? Yes ( ) No ( )

(d) If your answer in (c) above is yes, what difficulties do they experience?

Suggest two possible ways of overcoming the difficulties you listed in (d)

(e)(i) Does a student’s English language ability affect his/her performance in Mathematics? Yes ( ) No ( )

(ii) If your answer in f (ii) is yes, suggest possible solutions to overcome the Problem.
(f) (i) List the words used in Mathematics that you find difficult to explain

Suggest reasons for you answer h (i)

(ii) List words used in Mathematics that your students frequently find difficult

(g) Do you consider the issue of English language during setting of Mathematics test items?

(h) What other factors affect the performance in Mathematics?

(i) Has your school provided for teaching resources like models of solids?

Yes ( ) No ( ) Tick one

If yes, are they adequate? Yes ( ) No ( ) Tick one

(j) (i) List three Mathematics textbooks which you use in your class in order of preference starting with the one most preferred.
(ii) Which criteria did you use to select the books in (i)?

(k) Which methods do you use frequently in teaching Mathematics? Please tick three from the list below.

(i) Question and Answer method

(ii) Lecture method

(iii) Demonstration method

(iv) Discussion method

(v) Problem solving / project

(vi) Experiment

(vii) co-operative learning

(l) What strategies/measures has your school put in place to improve the performance in Mathematics?
APPENDIX II

LETTER OF INTRODUCTION

TO WHOM IT MAY CONCERN

THROUGH

THE SUB-COUNTY EDUCATION OFFICE

BUNGOMA EAST

Dear Sir/ Madam,

RE: LETTER OF TRANSMITTAL OF DATA COLLECTION MATERIAL

I am a student in Kenyatta University pursuing a master of Education Degree in the department of Educational Communication and Technology. I hereby seek permission to issue some students and teachers of Mathematics questionnaires and tests for research purposes. The research topic is entitled “the role of English language on Mathematics performance.” The study is designed to investigate whether English language competence of students plays a role on the performance of Mathematics in secondary schools in Bungoma East Sub-County. Your assistance will be highly appreciated.

Yours faithfully,

WAFULA AMOS WANJALA
APPENDIX III

SECONDARY SCHOOLS IN BUNGOMA EAST SUB-COUNTY AS AT 1ST SEPTEMBER, 2011

<table>
<thead>
<tr>
<th>NAME OF SCHOOL</th>
<th>TYPE OF SCHOOL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. LUGULU GIRLS</td>
<td>NATIONAL</td>
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<tr>
<td>2. ST. CECILIA MISIKHU</td>
<td>COUNTY</td>
</tr>
<tr>
<td>3. MILO BOYS</td>
<td>COUNTY</td>
</tr>
<tr>
<td>4. BOKOLI BOYS</td>
<td>COUNTY</td>
</tr>
<tr>
<td>5. KUYWA</td>
<td>SUB-COUNTY</td>
</tr>
<tr>
<td>6. NAMAWANGA GIRLS</td>
<td>COUNTY</td>
</tr>
<tr>
<td>7. CHEBOSI BOYS</td>
<td>SUB-COUNTY</td>
</tr>
<tr>
<td>8. NDIVISI GIRLS COUNTY</td>
<td>SUB-COUNTY</td>
</tr>
<tr>
<td>9. NDIVISI BOYS</td>
<td>COUNTY</td>
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<tr>
<td>10. KITUNI</td>
<td>COUNTY</td>
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<tr>
<td>11. ST. MATHEW’S ACK</td>
<td>SUB-COUNTY</td>
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<tr>
<td>12. MISIKHU FRIENDS</td>
<td>COUNTY</td>
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<td>13. MUJI</td>
<td>SUB-COUNTY</td>
</tr>
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<td>--------------------------</td>
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<td>14. ST. FRANCIS MAKEMO</td>
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<td>38.</td>
<td>LUGULU MIXED</td>
</tr>
</tbody>
</table>

**Source:** Sub-County Education office, Bungoma East
APPENDIX IV

THIS IS TO CERTIFY THAT:
MR. JAMES RANGASA WAPILE of KENYATTA UNIVERSITY, P.O. BOX 50200
BUNGOMA has been permitted to
conduct research in Bungoma County

on the topic: THE ROLE OF LEARNERS
ENGLISH LANGUAGE COMPETENCE ON
MATHEMATICS PERFORMANCE IN
SECONDARY SCHOOLS IN BUNGOMA
EAST SUB COUNTY, KENYA.

for the period ending:
30th June, 2015

Signature

APPENDIX IV

CONDITIONS

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

Permit No.: NACOSTIP/15/5680/7430
Date of Issue: 10th August, 2015
Fee Received: Ksh. 1000

National Commission for Science,
Technology & Innovation

RESEARCH CLEARANCE
PERM/11

Serial No. A

CONDITIONS: see last page

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