AN ASSESSMENT OF THE IMPLEMENTATION OF MATHEMATICS ALTERNATIVE B CURRICULUM IN SECONDARY SCHOOLS IN EMBAKASI DISTRICT, KENYA

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A Research Project Submitted in Partial Fulfilment of the Requirements of the Award of a Degree in Master of Education in Curriculum Studies

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DECLARATION

This research proposal is my original work and has not been presented for award of a degree in any other university

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This project is dedicated to my loving wife Jane Wamaitha Kinyua, our dear children Zipporah, Livingstone and Evelyn Ngugi.
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<tr>
<td>ICME</td>
<td>International Congress on the Teaching of Mathematics</td>
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<td>KCSE</td>
<td>Kenya Certificate of Secondary Education</td>
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<td>KIE</td>
<td>Kenya the institute of Education</td>
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<td>KNEC</td>
<td>Kenya National Examinations Council</td>
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<td>MoE</td>
<td>Ministry of Education</td>
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<td>NAEP</td>
<td>National Assessment of Educational Progress</td>
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<td>NECTA</td>
<td>National Examination Council of Tanzania</td>
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<td>NFE</td>
<td>Non-Formal Education</td>
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<tr>
<td>OECD</td>
<td>Organisation for Economic Co-operation and Development</td>
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<tr>
<td>SACMEQ</td>
<td>South African consortium for monitoring Educational Quality</td>
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<tr>
<td>SMASE</td>
<td>Strengthening of Mathematics and Science Education</td>
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<tr>
<td>SPSS</td>
<td>Statistical Package for Social Sciences</td>
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<td>UK</td>
<td>United Kingdom</td>
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<td>USA</td>
<td>United States of America</td>
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<tr>
<td>UNESCO</td>
<td>United Nations Educational Scientific and Cultural Organisation</td>
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<tr>
<td>WECSA</td>
<td>Western, Eastern, Central and Southern Africa</td>
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ABSTRACT

Mathematics alternative B curriculum was introduction in Kenyan secondary schools in 2009 in order to address the poor performance in mathematics by secondary school learners in the Kenya Certificate of Secondary Education (KCSE) examinations and foster positive attitude towards mathematics. Despite being a simpler version of the two mathematics subjects offered in Kenyan secondary schools (Mihezo-O’Connor, 2011), examination results indicate that performance did not improve as it was anticipated (KNEC statistic, 2011). The purpose of this study therefore, was to assess the implementation of mathematics alternative ‘B’ curriculum in secondary schools in Embakasi district in Nairobi in relation to teaching and instructional methods being used in the implementation of mathematics alternative B curriculum, the academic and professional qualification of teachers implementing mathematics alternative B curriculum; the adequacy of learning and teaching resources necessary for its implementation and determine learners’ attitudes towards mathematics alternative B curriculum. The study was guided by Leithwood’s model of evaluation of curriculum implementation. This study adopted descriptive survey design. The sample comprised of 9 principals/directors, 14 mathematics teachers and 232 students. Data were collected by use questionnaires, checklist and document analysis guide and analysed by use of descriptive and inferential statistics. The findings indicate that teachers used a variety of methods to teach mathematics in class. However, teachers rated themselves as using explanation and demonstration methods prominently. The study revealed that although, directors, principals and mathematics teachers were not in-serviced before the implementation of mathematics curriculum, the majority of them had the right academic qualifications to implement it. It was found that the implementation of mathematics alternative B curriculum was constrained by inadequate teaching and learning resources. It was established that students had positive attitude towards the mathematics alternative B subject. It can be concluded that schools were not adequately prepared to implement the mathematics alternative B curriculum. The study recommends that Kenya Institute of Education (KIE) initiate in-service courses for teachers implementing the curriculum. School administration should provide enough teaching and learning resources needed for implementation of mathematics alternative B curriculum as soon as possible. Higher education institutions should immediately come up with the training program for teachers for mathematics alternative B curriculum. This would enable teachers to handle learners struggling with mathematics as it is the case in Singapore. Finally, since the study was carried in an urban setting there is need to conduct a similar study in other districts to find out if the same findings will be obtained. A longitudinal study should be done to find out whether the two cohorts of learners that opted for mathematics alternative B subject face any challenge in career choice, development and in the job market.
CHAPTER ONE

INTRODUCTION

1.1 Background to the study

One of the Dakar Framework of Action 2000 goals is improving all aspects of the quality of education, and ensuring excellence of all, so that recognized and measurable learning outcomes are achieved by all especially in literacy, numeracy and essential life skills (UNESCO, 2000). However, data available indicate that most of numeracy students still perform below levels considered proficient by experts. Substantial achievement gaps in mathematics still persist.

Falling numbers of high school students choosing to pursue the study of mathematics and science has become a matter of considerable societal concern and debate both United Kingdom (UK) and United States (US) (Osborne, Simon & Collins 2011) and Australia (Awad, 2008). For nearly 30 years students’ performance in science and mathematics has remained at disappointing levels in America. According to the 2000 National Assessment of Educational Progress (NAEP) in USA, only (25 %) of fourth and eighth graders were performing at above proficient levels in mathematics.

International, regional and national assessments on mathematics conducted since 1999 show that poor learning outcomes still characterize many countries worldwide (UNESCO, 2007). Results of a third international study of achievements in mathematics indicates that achievement in the 14
economically advanced nations that took part in the study were generally low. Perveen (2009) states that (80 %) of the unsuccessful students in the secondary school examination in Pakistan failed due to poor grades in mathematics.

Studies done by the Female Education in Mathematics and Science in Africa (FEMSA) both in Anglophone and Francophone countries in Africa and report from a regional conference for countries in Western, Eastern, Central and Southern Africa (WECS) held in 2001 have established that poor performance in mathematics and science in primary, secondary level and post secondary institutions is prevalent in many countries across the Africa continent (Ateng’ogwel, Odhiambo & Kibe, 2008; Mji & Makga, 2006). For a long time in kenya, more than70% of the students fail to attain quality grades (A, A-, B+, B & B-) in mathematics. In 1980, 72.7% and 75.1% in 1981 of the candidates obtained a failing grade (Eshiwani, 1983). The KNEC report for 2004 shows that, 79.2% (1999), and 74.3% in 2004 failed to obtain quality grades (Mihesto - O’Connor, 2011). Between the year 2005 and 2010 mean score for mathematics ranged from (15.96 % to 21.30 %) which translated to an E grade (MoE, 2011).

Having all students performing well in mathematics has been many countries national priority in both the developed and developing counties for decades now (Maccini and Calvin, 2000). The European countries meeting under the auspices of the new strategies framework for European co-operation in education and training, European 2020 forum held in Brussels in 2010 raised concerns about the high number of low achievers in basic skills in
mathematics and science and stated the need to urgently address this matter in order to enhance employability of young people and to bring them into the world of work after school (Son & Carica, 2010). One of this meeting’s goals is to reduce the number of low achieving 15-years-old in reading, mathematics and science to less than 15 percent by the year 2020 (Son & Carica, 2010).

Low achievement in mathematics is complex and multifaceted. Tuge (2008) and Lerch and Kelly (1966) observe that (75 %) of students fail in mathematics because the curriculum is specifically directed towards catering for the needs of students with average or above average abilities. On the other hand, Dweck (2000) found poor performance in mathematics to be a function of low ability instead of what is considered more desirable attribution (such as failure due to lack of effort). However, according to Lerch and Kelly (1966) there is little doubt that students in slow learning group have the capacity to achieve success, develop into useful and productive citizens if they are guided in the acquisition of the knowledge, skills and self acceptance appropriate to their needs.

In-depth examination of the population of students struggling with mathematics indicate that without substantive modification to curriculum these students do not exhibit high levels of success in academic measures (Woodward & Brown, 2006). Bush (2006) stated that early intervention to students who struggle with mathematics was critical. According to Bush, this was the only way that such students may have a better chance at good, high-
wage jobs. One way of making mathematics education accessible to all is through offering students the mathematics they need for their future (Warssaman, 2011). According to Ramirez (2003), this would most likely be evidenced by a variety of mathematics courses offered to students in order to accommodate students of different abilities, interests, and aptitudes.

The Fifth International Congress on the Teaching of Mathematics (ICME 5) held in Adelaide, South Australia, in August 24-29, 1984, observed that many countries had one mathematics syllabus for each year of the education system. As a result, no basic mathematics course with significant skills needed by over 70 percent of school leavers existed (Damerow, 1984). Instead, the general character of mathematical education often resulted in a strong aversion to mathematics. Members suggested for the development of an alternative mathematics programme to cater for the varied needs of all students in a range of circumstances and with a range of individual students' aspirations (UNESCO, 1984).

According to Miliband (2004), alternative curriculum seeks to improve the education achievement of all learners by tackling underachievement of particular groups of learners at risk of educational failure due to various risk factors such as poor economic background, poor grades, truancy, disruptive behavior, and suspension (Kliener, Porch & Farris, 2002). Ahuja (2006) suggests that there is a need to develop an official 'Alternate Mathematics Framework' for slower learners. According to Ahuja, such a framework would ensure that these students are taught all the required material in less depth but
at a slower pace by specially trained and competent mathematics teachers within an extended period of time. This curriculum is therefore, expected to have an effect on how students are to be organized in mathematics classes; the teaching and learning methods to be used; the extent for which emphasis was to be placed on co-operation learning as against competition and for the provision that should be made for students from diverse cultural group (UNESCO, 1984).

According to (Ball, 1981), the implementation of alternative mathematics curriculum would lead to learner’s change of general attitude towards mathematics as a subject, slow the pace of teaching mathematics; diminish variance in the achievement outcomes in mathematics besides overcoming certain difficulties arising from mathematics course based on single closed system.

Several countries have since developed several mathematics syllabi or initiated elaborate support programme for slower mathematics students. For instance, although most states and NCTM curricula in the U.S. do not provide any alternative framework for slower mathematics students, many school districts across the United States are upgrading the quality of the mathematics curriculum by exploring alternatives for both struggling and high-achieving students (Gamoran, 1997; Ahuja, 2005). In most of the states, slow mathematics students in the U.S. are often tracked into slower and watered down mathematics courses where they are generally not taught the required mathematics materials. Schmidt (1998) revealed that over 75% of the
American schools eighth graders often took different mathematics courses—regular or 'general' math, remedial math, enriched math, prealgebra and algebra.

In Finland, compulsory education goes through age 16. It then branches into two tracks of further secondary education: General upper secondary education and vocational education (Vocational education and training in Finland, 2004). Students in vocational education learn mathematics topics related to their specialization but only in so far as required to know and perform in a typical job in that field. Students in the general upper secondary education have two options; the short and long mathematics syllabus. All students that complete the short syllabus graduates with an equivalent of up to Algebra 1 with further specialization in mathematics of Finance, business or computers studies (Wasserman, 2011).

Singaporean educational system support programme for students slower in mathematics is more elaborate. Each grade in the slower stream is provided with special mathematics textbooks and well-trained specialist mathematics teachers. Mathematics subject is taught by subject-based banding, or differentiated instruction. Banding provides students with the opportunity to mix instruction levels based on their interests and abilities. There are two tracks to choose from, foundation—for those students struggling with a particular subject—and standard—for those doing well in a subject (Ginsburg, Leinwand, Anstrom, & Pollock 2005). Although the path one follows is dependent mostly on test scores, and not necessarily interest, these tracks are
very practical in catering for mathematical knowledge and needs around specific students aptitude and career interests (Ahuja, 2005; Wasserman, 2011).

Australia's, states such as Queensland, New South Wales and Victoria, mathematics curriculum structure provides students of different abilities with much choice and flexibility. There are clear pathways identified for students to follow, with increased in content and difficulty at each of the pathways (Coupland, 2006).

In Pakistan secondary mathematics syllabus is divided into advanced and general mathematics, for the students strong in mathematics and those experiencing challenges in learning mathematics respectively. The syllabus stipulates the content in details and examinations are also set according to the each of the syllabus (Halai, 2010; EdQual, 2007). New Zealand (Steel, 2005) mathematics curricula are structured in such a way that students of different abilities, aptitudes and varying interests, have an opportunity to choose the type of curriculum to take and even career path to follow.

Kenya Institute of Education (KIE) introduced mathematics alternative 'B' syllabus at secondary school level in January 2009 (KIE, 2010). This was as a result of numerous recommendations made in several KIE monitoring reports namely: KIE Report No. 53 (1995); KIE Academia Board of 1997 recommendation of 1999, Report No. 68 [1999] (KIE, 2007) and Non-Formal Education (NFE) Survey Report (2008). The general observation from these reports was that mathematics curriculum was not sensitive to learners with
special needs. The two main reasons of developing and implementing mathematics alternative B curriculum was to tackle poor achievement in mathematics and foster positive attitude towards mathematics(KIE,2008). However, although schools that offer mathematics alternative B subject improved performance marginally, results indicate that mathematics alternative A subject registered better performance than latter. It is imperative that an assessment of the implementation process of this subject is carried out.

1.2 The statement of the problem

Despite mathematics alternative B subject being considered as a simpler version of the two mathematics subject offered in Kenyan secondary schools (Miheso-O'Connor, 2011), the students examined did improve the performance as it was anticipated (Wachira, 2011). According to (KNEC statistic, 2011) mathematics alternative A subject performance improved to (23.06 %) from the previous year’s (21.13%). However, few gains were noticeable in the newly introduced mathematics alternative B subject which was examined for the first time in 2010. Mean score for the mathematics examination was (19.09 %), (3.97 %) lower than the results of candidates that sat for mathematics alternative A examination. According to Nairobi province examination office, the mean score for mathematics alternative A and B subjects for the year 2010 and 2011 was 4.113: 3.896 and 4.308:3.896 respectively.

This is a clear indication that other factors other than the curriculum influenced the outcomes. Altricher (2005) contends that all serious
improvement programs encounter problems. Therefore, the assessment of both the learner and the process of implementing change are essential for early and quick intervention measures to be taken. Since the introduction of mathematics alternative B curriculum in secondary school in Kenya, no study known to the researcher has been carried out regarding the implementation of mathematics alternative B subject in secondary schools in Embakasi district. This study, therefore, sought to fill this gap.

1.3. Purpose of the study

The purpose of this study was to assess the implementation of mathematics alternative ‘B’ curriculum in secondary schools in Embakasi district.

1.4. Objectives of the study

This study was guided by the following objectives:

(i) To establish the teaching and instructional methods used in the implementation of Mathematics Alternative B curriculum in secondary schools in Embakasi district.

(ii) To assess academic and professional qualifications of teachers implementing mathematics alternative B in secondary schools in Embakasi district.

(iii) To establish the adequacy of learning and teaching resources in the implementation of mathematics alternative B in secondary schools in Embakasi district.
To determine learners' attitudes toward mathematics alternative B curriculum in secondary school in secondary schools in Embakasi district.

1.5 Research questions

The study was guided by the following research questions

(i) What teaching and instructional methods are being used in the implementation of mathematics alternative B curriculum in secondary schools in Embakasi district?

(ii) What is the academic and professional qualification of the teachers implementing mathematics alternative B curriculum in secondary schools in Embakasi district?

(iii) How adequate are the teaching and learning resources needed in facilitating the implementation of mathematics alternative B curriculum in secondary schools Embakasi district?

(iv) What are the learners' attitudes toward mathematics alternative B curriculum in secondary schools Embakasi district?

1.6. Significance of the study

The successful completion of the study may be of benefit to the Ministry of Education. This is because the study provided information on how mathematics alternative B curriculum is being implemented in secondary schools and highlighted possible constraints impeding proper
implementation of mathematics alternative B curriculum. The study results and recommendations form part of literature on the implementation of mathematics alternative B curriculum in Kenya. Finally the study forms foundation for other researchers to conduct other studies on mathematics alternative B curriculum for secondary schools in other regions in the country.

1.7 Limitations of the study

Mitchell, Wirt and Marshall (1986) define limitations of the study as those characteristics of design or methodology that set parameters on the application or interpretation of the results of the study. Due to varied backgrounds and experiences on the implementation of mathematics alternative B curriculum the researcher found that the respondents had already formed negative attitude toward the mathematics alternative ‘B’ curriculum. This would have affected the reliability of the responses. Again, most schools offering mathematics alternative B subject were private enterprises and as such the researcher was afraid that the respondents might be reluctant to respond to the questionnaires for fear that their schools were being audited. These challenges were overcome through the researcher assuring respondents that the name of the school and the identity of the respondent will remain confidential.

1.8 Delimitations of the study

The delimitations of a study are those characteristics that limit the scope of the inquiry (Mitchell, Wirt and Marshall, 1986). The research was restricted to secondary schools implementing mathematics alternative B curriculum in
Embakasi district both public and private schools. Information was gathered from the school directors/principals, teachers and learners because they are directly involved in the implementation of mathematic alternative B curriculum. Finally, due to different circumstance that characterise different secondary schools in Kenya, the results of the study may not be generalized or transferred to other secondary schools outside the area of study.

1.9 Basic assumptions of the study

The following assumptions were made;

i. That the Kenya Certificate of Secondary Education (KCSE) is an acceptable and valid measure of students’ achievement in mathematics.

ii. That respondents would provide accurate information.

iii. That secondary schools expose students to a uniform mathematics curriculum according to the Kenya National Examinations Council (KNEC) and the Kenya Institute of Education (KIE) requirements.

1.10 Definition of significant terms

The following terms are defined within the context of this study:

**Attitude** refers to predisposition or tendency to respond positively or negatively towards mathematics

**Examination** refers to written exercises, oral questions, or practical tasks, set to test a candidate’s knowledge and skill
Implementation refers the process of putting into practice a program through a set of activities in order to achieve more certain desired learning outcomes for students.

Learning/teaching resources refers to facilities and resources available for teaching and learning such as textbooks, teachers and time.

Mathematics alternative B curriculum refers to secondary school mathematics course introduced in Kenyan secondary schools in 2009.

Poor performance refers to any performance below expected desired standard. In this study D- and E will be failing grade.

Teacher's professional development refers a process of relearning competencies and attitudes by teachers.

1.11 Organization of the study

The study is organized into five chapters. Chapter one lays emphasis on the background of the study, statement of the problem and research objectives. It also covers the significance of the study, limitations and delimitations of the study and definition of significant terms. Chapter two focuses on the review of literature under the following sub-headings: the concept of curriculum implementation, studies on differentiated curriculum for learners with different abilities and aptitude, teachers professional and academic qualification influence on the implementation of curriculum, teaching and learning resources for curriculum implementation, learners' attitudes towards mathematics and the instructional and teaching methods applied in
the teaching mathematics, summary of literature review, theoretical framework and the conceptual frameworks of the study.

Chapter three describes the methodology the researcher used to conduct the study, the research design, and the target population, sample size used in the study and sampling procedures. It also discusses the research instruments used to gather information, reliability and validity of the instruments. Data collection procedures and data analysis techniques have also been discussed. Chapter four focuses on data analysis and interpretation and the discussions of the results. Finally, Chapter five covers the summary of the study, conclusion, recommendations of the study and suggestions for further research.
CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents a review of literature related to the study under the following sub-headings: the concept of curriculum implementation; studies on differentiated curriculum for learners with different abilities and aptitude; teachers professional and academic qualification influence on the implementation of curriculum; teaching and learning resources for curriculum implementation; the instructional and teaching methods applied on the implementation of new curriculum and learners attitudes towards mathematics and its effect on curriculum implementation. Theoretical framework, conceptual framework and the summary of the study are discussed.

2.2 The concept of curriculum implementation

According to Fullan (1997) there are two reasons why focusing on implementation is crucial to success when implementing a new curriculum, the first is that it is not possible to know what has changed (if anything) without attempting to conceptualize and measure it directly. Fullan (1997) points that without knowing what’s in the “black box” of implementation we do not know how to interpret the outcomes (or absence of outcomes): Is failure due to implementing poor ideas, or to the inability to implement good ideas? Is success due to a well-implemented innovation, or to some extraneous factor? In short, without implementation data, particular changes cannot be
linked to learning outcomes. The second reason why it is important to examine implementation is to understand some of the reasons why so many educational innovations and reforms fail.

There is a need for research that pays particular attention to the curriculum implementation process if further progress is to be made in curriculum design and if instructional practices are going to be improved because the way a new curriculum is implemented determine how the desired educational objectives are obtained. There is a need to alter the individual teacher knowledge, actions and attitudes (Ornstein and Hunkins, 1998) by focusing on what happens in practice. Yet this is difficult, the required restructuring and replacement (Ornstein and Hunkins, 1998) creates dilemmas for teachers and demands that they make significant changes in their values and beliefs (Anderson and Helms, 2001). All the carefully planned opportunities to use a new curriculum as a vehicle to implement new approaches and strategies in science teaching can become a challenge, and at best an opportunity to reflect on long-held ideas and beliefs about students, learning and teaching (Davis, 2002).

The reasons for failure in a large number of curriculum projects over the last twenty years are summarized by Scott (1994) who found that this failure relates to organizational structure and school administration, lack of meaningful role in staff development decision making for teachers, and isolation of teachers. He explains the lack of meaningful role in staff development decision making for teachers using Roberts (1980) and Munby’s (1984) concept of “curriculum interface.” Scott states teachers facing
curriculum changes need to have their immediate classroom needs met, they
need to be given assistance to learn the new skills, and the resources required
to bring about the changes being promoted in the new curriculum, and this
needs to be an integral part of the process of ongoing training for teachers.

2.3 Studies on differentiated mathematics curriculum for learners with
different abilities and aptitude

Many studies of ability grouping have focused on questions of equity, and the
negative effects on children who are taught mathematics in low-ability classes
(Steel, 2000). Studies carried out in America in the late 1990s indicated that
naturalistic effort to raise the achievement of low-ability; low income
secondary students through eliminating general track math and replace them
with transition course similar to alternative mathematics curriculum in Kenya
had been partly successful (Gamoran, Porter, Smithson and White
1997; Gamoran, 1997). The result of another yearlong quasi-experimental
study in carried in America, showed that students in the intervention group
achieved higher academic outcomes and more positive attitude than in the
comparison group (Woodward and Brown, 2006).

Kulik and Kulik (1992) showed that programmes which offer the same
mathematics curriculum had little or no effect on achievement, but
programmes differentiated for the aptitude of the group are beneficial for
pupils of all ability levels. In the contrary Slavin (1990) found that there were
no significant positive effects of ability grouping for any programmes, except
acceleration for the gifted. Braddock and Slavin (1995) on the other hand
cited several studies that show negative effects of ability grouping, especially on students in low-ability groups.

According to Braddock and Slavin low ability group learners are frequently taught by less able teachers, cover less content than higher ability classes, and suffer from loss of motivation and self-image. Detractors of differentiated instruction claim that students’ overall performance does not increase. Instead the achievement gap between high and low achievement students widens. In addition to this students are offered with unequal opportunities to learn, and that it produces increased social segregation in the schools (Davenport, 1993).

However, in a study carried out in Kenya in 140 randomly selected schools Bungoma and Butere-Mumias districts in Western Province, Kenya (Duflo, Dupas & Kremer, 2011). Results show that grouping students by preparedness or prior achievement and focusing the teaching material at the most appropriate level could potentially have large positive effects with little or no additional resource cost. According to Duflo, Dupas and Kremer, comparison between the postintervention test scores of students in the tracking and nontracking schools showed that students in tracking schools scored 0.14 standard deviations higher than students in nontracking schools overall.

2.4 Teachers academic and professional qualification during the implementation of new curriculum

Teachers have a major role in determining and implementing the curriculum. They interpret and give life to the curriculum specifications of governments and ministries, and translate curriculum intentions into classroom practices
Norris, 1998). As Scott (1994) mentions, they not only control the rate but also the degree of change of any curriculum. According to Kimpston (1985) studies focusing on teachers’ beliefs about their roles in the curriculum implementation process are the most efficient way to answer the question of what does or does not get implemented in the curriculum. The most important conditions for developing better designed curriculum materials are provided by analyzing teacher roles (Van Den-Akker, 1988).

Crocker and Banfield, (1986) define the successful implementation of a curriculum as its spirit being conveyed to the pupils by the teachers. Accordingly what a given teacher believes knows and does determine the form of education given to a student. If enough were known about the curriculum implementation process and how teachers influence this process, research findings and developments would be more likely to be actually used by practitioners.

Mitchener and Anderson (1989) point to the importance of the teacher role and state that they determine the success or failure of a new curriculum. Similarly, Crocker and Banfield (1986) underline the necessity of a fuller understanding of teacher thoughts, judgments, and decisions relative to curriculum if further progress is to be made in curriculum characteristics and instructional practices. Views of teachers on a range of factors within the school and classroom setting are likely to be important determinants of curriculum translation. Cronin-Jones (1991) also points out that teacher’s perceptions and beliefs play a critical role in the curriculum implementation process. The incompatibility
of the objectives and activities in the programs with teacher views of curriculum characteristics and instructional practices are identified by Crocker and Banfield (1986) as one of the major reasons of failure in many curriculum projects in the 1960’s.

According to Cho (2001) teachers demonstrate different meanings of fidelity of implementation in their everyday classroom situations. For instance, Cho reports that the novice teacher in the study faithfully used the new curriculum materials based primarily upon the intent of the curriculum developer. What worked best for student learning in her classroom was guaranteeing the right things covered at right times and in an organized manner because the teacher herself felt a need to learn new skills and build on her knowledge for teaching.

In contrast, the experienced teacher considered the new curriculum materials to be teaching tools and adaptively used the ideas of the curriculum developer. The critical decisions she made were directly related to her interpretation of students’ needs as she perceived them.

High quality teaching is the leverage point for improving how student can effectively learn mathematics. Louis and Roseabulum (1981) cited in Kelwon, (1991) posit that interaction and staff development are crucial regardless of what change takes place within the education sector. According to Kelwon, (1991) and Liu and Linggi, (2009) successful implementation of innovation is possible when there are combined concrete teacher-specific training activities, on-going continuous assistance and support during the process of implementation. A study carried out in
KwaZulu Natal by Khubeka (1989) cited by (Menoe, 2005) revealed that in an area where the matriculation (grade 12) results were low in mathematics, the teachers were not qualified, had no extensive experience teaching mathematics and had to teach two or more subjects as well in addition to mathematics.

However, (Hanegan, Friden and Nelson, 2002; Roth and Bowen, 1998) found that although professional development courses are designed to help teachers learn their subject in greater depth and to use effective teaching practices, most teachers do not apply their professional development learning experiences in the classroom. Handelsman, Ebert-May, Beichner, Bruns and DeHaan, 2004) suggest that in order to integrate new knowledge gained from professional development into their classroom practices, teachers need field work, guidance, and communication from their professional development coordinators.

2.5 Teaching and learning resources for the implementation of curriculum

The focal point of many of the studies investigating implementation is the teaching and learning resources as this can positively or negatively influence the process of implementation. As Suarez, Pias and Membiela (1998) indicate the classroom environment can cause differences in implementation in different classrooms and in different schools. UNESCO (2005) notes that the availability of a range of teaching and related equipment suppliers, furniture and various forms of printed media for teachers and learners is critical and
facilitating the processes of teaching and learning worldwide. The report further notes that access to a range of resources and services enable teachers to enrich the teaching environment. The report also notes that developing countries incur high recurrent expenditure on teacher's salaries, which severally restricts the funds available to improve classroom and teacher resources by the governments.

Some school level environmental factors identified by Shymansky and Kyle (1992) are content selected, available facilities, availability of resources and materials, management of materials, access to existing and emerging technologies, instructional practices, scheduling of teacher time and assessment protocols. Similarly number of students, context and subject matter related factors are listed by Strage and Bol (1996) as influencing the realization of instructional recommendations made by the curriculum innovators.

Teaching and learning materials incorporate a broad category of education-related resources. These includes textbooks, instructional guides, workbooks, practice exercises, activities, tests, calculators, audio-visual materials, and supplementary readers in libraries, classrooms, or homes, person, tool or piece of equipment that has the potential of aiding the teaching and learning process. In one of the studies of curriculum implementation, inadequate materials, space and equipment were mentioned 328 times as being problem to implementation well above the other factors except clarity and familiarity with goals and methods (Berman and Pauly, 1975).
Of these resources, textbooks are the most commonly utilized, studied, and documented input for classroom instruction. (Kelwon, 1991; Meyer and Nassamoto, 2008). Textbooks are recognized as a critical component of instruction; they support the curriculum and relate directly to the syllabus of the course. Kelwon (1991) observes that learning gains occur as a result of textbooks investment than it is as a result of the educational interventions such as teacher training. During the 1970s and 1980s, school effectiveness studies highlighted the positive impact that relevant, good-quality, affordable textbooks had on achievement (Abadzi, 2006).

The EFA 2005 Global Monitoring Report describes textbooks as an “enabling input,” an important resource that is intrinsically interrelated to the teaching and learning processes. Particularly in developing countries, evidence suggests that school effectiveness is linked to direct material inputs such as textbooks, and that textbooks are one of the most cost-effective means of positively impacting quality in poor resource environments (Crossley and Murby, 1994). As early as 1978, the World Bank issued a staff working paper examining the relationship between textbooks and achievement in developing countries. Based on a review of the evidence, the availability of books appears to be the most consistent school factor in predicting academic achievement.

Scientific calculator has emerged as another useful tool for teaching and learning of Mathematics in Kenya since 2002. However, despite the adoption of scientific calculators as a tool to aid in teaching and learning Mathematics, a study carried out in Emuhaya district indicated that only 5.36 percent of the
learners, accessed scientific calculators during the teaching and learning of Mathematics (Ochanda and Indoshi, 2011). A situation where many learners do not access a calculator leaves the learner with no option but to borrow from others in the classroom. This does not lead to good time management. This could be a reason why performance in the subject has persistently been affected negatively, since availability of this resource determines whether a learner will be able to use it effectively in computations or not (Ochanda and Indoshi, 2011).

In a study, questionnaires were filled out by 21 mathematics teachers and their 200 9th grade students in three public schools in Ankara Turkey (Turan, 1996). According to the findings, insufficient facilities and the physical condition of schools prevented effective implementation of mathematics education. Turan noted that lessons were teacher-centered with students oriented to rote learning. She states that the class hours allocated for mathematics courses were not enough. Similarly, insufficient classroom conditions, crowded classrooms and time limitations were found to be the main reasons for poor mathematics performance. The role of educational resources as a predictor of students’ achievement however, has been severely controversial. Heyneman, Farrell and Sepulveda-Stuardo (1978) caution that the impact of the provision of the textbooks is not uniform across schools or countries. While Hanushek (1986, 1997) asserts that additional resources per se does not improve educational outcomes but contexts, processes, methods and methodologies are regarded as responsible to transform educational resources in students outcome.
Lockhead and Verspoor (1991) point out that the learning environments in many schools in the developing countries are poor. To improve learning, Lockheed and Verspoor suggested that resources be availed and be well managed. They single out textbooks as the most important instructional materials at all levels of training because they reflect and deliver the curriculum.

According to MOEST (2003), studies carried out by the World Bank in Kenya show that 70% of the school's visited had no library and other learning and teaching materials. Similar studies carried out in Kenya by South African consortium for monitoring Educational Quality (SACMEQ) in 1999 revealed a critical shortage of text books and physical facilities in many schools. According to MoEST this contributed towards poor examination performance in many schools in Kenya. This study looked at sufficiency of mathematics teaching and learning materials and how they affect the implementation mathematics curriculum.

2.6 Learners' attitudes towards mathematics

The term attitudes have been defined as an organized predisposition to think, feel, perceive and behave towards a reference or cognitive object. It is seen as a learnt predisposition to respond in a consistency favourable manner with respect to a given object (Iriandis, 1971). Attitudes exist within all persons in regard to every topic object concept or human being that a person evaluates. This means that at one time an individual is able to selectively respond to an object within the environment either positively or negatively. Student attitudes
toward mathematics and their understanding of the relevance of this subject to their future aspirations affect students’ enthusiasm for studying mathematics, and help determine whether they will continue on to more advanced studies in these fields. In addition, counselling from teachers can determine whether students will take the more advanced courses.

Student attitudes about mathematics and their attitudes about their ability in mathematics have been recognized as predictors of mathematics achievement. Rangappa (1994) posits that a student’s view of their own abilities and willingness to accept responsibility in their learning can impact that student’s achievement.

In a study of data from 1000 students from rural and urban areas of Bangalore, India, Rangappa found significant differences in mathematics achievement for students with high, normal, and low self-concepts. Rangappa concluded that students with high self-concepts performed better in mathematics than students with normal or low self-concepts. This concurs with many of (Simpson, Koballa, Oliver and Crawley, 1994) studies on students’ attitudes toward different science subjects. Generally, a negative attitude toward a given subject leads to lack of interest and, when subjects can be selected, as in senior high school, to avoiding the subject or course.

Furthermore, a positive attitude toward science “leads to a positive commitment to science that influences lifelong interest and learning in science. Using Spearman’s rank and a chi-square test (Mwangi, 1983) revealed that a positively significant relationship existed between attitude
towards mathematics and mathematics attainment. For instance students who obtained distinction in mathematics (97.5 percent) had positive attitude towards mathematics (Kihara, 2002).

Negative attitude towards mathematics was found to be a challenge to the implementation of mathematics alternative B curriculum in schools in Kenya. According Kenya Institute of Education Report No.96 (KIE 2010), education stakeholders among them principals, teachers, students and parents alike considered mathematics alternative B curriculum substandard. Fifty percent (50%) of the respondents expressed fear of possible exclusion from some courses they could undertake when they join the university. The teachers on the other hand stated that the option was offering limited career course for students who were not aware of their abilities.

However, according Hallam and Ireson (2003) teachers generally hold positive attitudes towards classes where pupils are grouped by ability, although variations have been reported based on teachers’ prior experience. For instance experienced teachers appeared to be more supportive of mixed ability teaching, but they often found it more difficult to put into practice than those who had been recently trained to adopt such practices (Hallam and Ireson, 2003). The idea that mathematics alternative B curriculum was meant for low achievers led to stigma associated with this subject among students.

Ireson and Hallam (2001) demonstrated pupils’ sensitivity to structured ability grouping, after interviewing over 6000 students in Britain. According to Ireson and Hallam, stigmatization can occur in relation to pupils in the lower ability
groups. Although teasing may be endured by those in the top set, pupils’ performance was however, affected.

Although attitude is important factor in the implementation of mathematics curriculum, Park (2011) concludes that it may perhaps be wrong to accept student questionnaire results about their attitude at face value. According to Park, the high achievements of Korean students do not seem to be accompanied by correspondingly positive attitudes towards mathematics. The results of the TIMSS-R questionnaire, revealed that Korean students ranked very low in the indexes of ‘students’ report on whether it is important to do well in mathematics’, ‘students’ positive attitudes towards mathematics’, and ‘students’ self-concept in mathematics,’ yet according to the TIMSS-R results (Mullis, Martin, Gonzalez, and Chrostowski, 2004), top Korean mathematics students as well as students in general showed outstanding performance in mathematics. Korean students maintained a high position among 38 participating countries (OECD, 2001).

Trumper (2006) opines that for any major mathematics and science education reform to succeed efforts should be to emphasize the improvement of students’ attitudes. Trump concludes that perhaps the strongest message that emerges from studies done on student attitude towards mathematics, is the need to concentrate on ways to develop students’ affective responses so that they find personal satisfaction in doing mathematics and thus want to continue with it.
2.7 Instructional methods used by mathematics teachers in giving instructions

Every teacher must motivate his or her students and by all means he/she should ensure that every student is learning. A teacher is viewed to be the key learning resource not so much the main source of knowledge but as the central organizer of learning for his / her learners. As the central organizer of learning, the teacher should not over use one method in learning for example lecture method. Mokayal (1995) states that the best way of organizing teaching and learning is to use a variety of teaching and learning resources.

Although a move away from traditional, a teacher-centered, direct instruction towards a more student centered, understanding based form of teaching that focuses on exploration and experimentation is fundamental to many contemporary reforms in mathematics and science education, researchers report teachers continuing to teach in the same way they were taught. In Smerdon and Burkam’s (1999) study, it was found that teachers still view lecturing as the most expeditious method for covering a large volume of material.

Teaching approaches are important elements during curriculum change. It is assumed that as the curricula change so should the teaching methodology (MoE, 2011). Wang, Nojan, Strom and Walberg (1984) posit that for new curriculum to be implemented effectively, alternative instructional strategies need to be adopted too. A study on low attainers in primary mathematics in Singapore. Lee (1999) notes that one way to help low attainers is by enhancing
their mathematics specific self-esteem through creative and varied teaching strategies. Menoe (2005) and Muthwi (1981) observe that mathematics teaching is mostly teacher-centered with an emphasis on lecturing, question and answer exchange, written exercises, notes and tests.

Teacher-centred methods of teaching mathematics have been common in classroom because, teachers lacked confidence, mastery of subject matter content and basic teaching skills (Thijs, 1999: Howie, 2002; Motswiri, 2004). This resonates with the National Audit on Teacher Education (1995) cited in Menoe (2005). According to this audit teacher training colleges were not only out of step with current international advances in knowledge and methodologies but teachers seem to lack the knowledge of the approaches that enhances learning. Lack of teaching material, facilities and time and large class sizes have also made it hard to use learner-centered method of teaching mathematics. Examinations too have had a dominant influence on classroom instruction. Teachers often consider examinations success the top priority in teaching, and therefore, perceive teaching methods as dysfunctional when they are not directly related to the passing of examinations (Howie, 2002).

Finding of a study carried out in Pakistan on the impact of different research-based teaching strategies namely- do-talk-record, cooperative learning and, problem-solving strategies on students' learning. Halai (2010) revealed that teaching strategies introduced in classrooms brought about positive changes in the classroom discourse. Student outcomes in terms of academic achievement, their classroom participation and development of interpersonal skills- were
also impacted upon positively. Students too benefited academically (the average class percentage had increased from 34 percent to 67 percent) and non-academically (improved confidence and social skills, where students could argue, raise questions and describe their thinking without hesitation). The study suggests that mathematics teachers need to review their role in the teaching/learning processes in the classroom, otherwise any attempt to bring change will not be effective.

According to Ministry of Education in Kenya (2011), the learner should be placed at the centre of the teaching and learning process through methods that actively and meaningfully engage them in learning activities. Such methods include, group activities, discussion and problem solving. Wasiche (2006) observes that small group discussion and individualized instructions during the lesson, a teacher assisting one student at a time especially weak or low achievers, encouraging students to demonstrate to each other during the lesson, providing frequent feedback by giving assignments, marking and revising assignments immediately, motivating students by providing incentives for any small progress and encouraging students to interact freely in class are some of the techniques that can enhance students performance.

2.8 Summary of reviewed literature

This chapter starts with the introduction of the subject of study by examining some of the existing literature on the long time debate on benefits and negative effects of offering different mathematics curriculum to students with different abilities (Steel, 2005). It has also covered literature on areas that are critical
during the implementation of curriculum namely: teacher’s professional and academic qualification, the need for necessary resources for curriculum implementation, learners’ attitudes towards mathematics and how it affects curriculum implementation and the role played by instructional methods used by teachers in teaching mathematics. From literature, factors mention above affect the implementation of the curriculum. These in turn affect students’ achievement in mathematics.

2.9 Theoretical framework of the study

The study was based on Leithwood (1982) model of evaluating curriculum implementation. According to this model new curriculum implementation is a process of change and therefore, the educator, the learner and the educational institution has to change to accommodate reforms. Leithwood identified nine dimensions of curriculum innovation where change occurs these include: platform, objectives, student entry behaviours, assessment tools and procedures, instructional materials, learners’ attitude, teaching strategies, content and time.

Leithwood’s model of evaluation has four features. These are procedures for: identifying descriptive dimensions of the innovation; specifying practices implied by the innovation; describing actual practices; and comparing actual with intended practices (Leithwood and Montgomery, 1980).

For instance inadequate teaching and learning resources for the implementation of the new education programme, means there is a gap in actual classroom practice. This would be an indication that educators are
experiencing difficulties or have concerns which have adverse effects on the implementation of the innovation. This model suggests that the size of the gaps must be reduced so that the innovation is implemented. This model is appropriate for this study since it enabled the researcher to establish the how teachers qualifications, resources, teaching approaches and attitude of the learners and give recommendation for early intervention (Fullan, 2007).

2.10 Conceptual framework of the study

The conceptual framework of a study gives an idea of the variables to be covered by the study (Best & Khan 1981). This study was conceptualised on the variables in the study objectives. Figure 2.1

Schematic representation of the relationship among variables related to the implementation process of mathematics alternative B curriculum
Figure 2.1 shows the relationship between the dependent and independent variables of the study. As shown in the figure, inputs include the independent variables namely; learners’ attitudes towards the mathematics alternative B curriculum, teachers’ academic and professional qualification, the availability of teaching and learning resources needed for teaching and learning mathematics and the instructional and teaching methods applied by teachers during the teaching process; the process is the implementation of mathematics alternative B curriculum in secondary schools; and the output is the improved performance in mathematics by students. Therefore, through the manipulation of independent variables, it is possible to produce desirable outputs in the form of higher achievement scores in mathematics alternative B curriculum. The performance of the learner is the output which provides feedback about the implementation of the mathematics alternative B curriculum.
CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the research design used to carry out the study, the target population, sample size and sampling procedures and research instruments used. Data collection procedure and data analysis techniques have also been discussed.

3.2 Research design

This study adopted descriptive survey design. According to Mwiria and Wamahiu (1995) this design allows for the systematic collection and analysis of data in order to answer question concerning the current status of the implementation of education programme in schools. This approach was appropriate for this study since the researcher collected data regarding the implementation of mathematics alternative B curriculum without manipulating any variables.

3.3 Target population

Gall, Borg and Gall (1996), define target population as all members of a real or hypothetical set of people, events or objects from which researchers generate data for a study. According to information available at Embakasi District Education Office and Nairobi Province examination office, 9 schools offer mathematics alternative B curriculum. The target population in this study
thus comprised of 9 secondary schools and their directors, 14 mathematics teachers and 350 Form Four students. The total population for the study, therefore, consisted of 373 respondents.

3.4 Sample size and sampling procedure

Best and Kahn (2000) define a sample as a small proportion of the population that is selected for observation and analysis. Sampling means selecting a given number of subjects from a defined population as representative of that population (Orodho, 2002). Due to the small number schools implementing mathematics alternative B curriculum, the census survey was used in the study. Therefore, entire target population was used in the study (Gay, Mills and Airasians, 2006). Two schools from the neighbouring district were used for pilot testing of the instruments. Three hundred and seventy three respondents, comprising of 9 directors 14 mathematics teachers and 340 students were used in the study.

3.5 Research instruments of the study.

Three instruments were used to collect data. These were questionnaires for directors, mathematics teachers and learners, a checklist and document analysis guide.

3.5.1 Questionnaires for directors and teachers

Questionnaires comprised of four sections. Section one collected the background information of the teachers. Each of the other three sections collected information on the academic and professional qualification of
directors and teachers, the availability of resources and the fifth section assessed the instructional and teaching methods applied in the teaching mathematics alternative B curriculum in schools in Embakasi district.

3.5.2 Questionnaires for learners

The questionnaire was divided into four sections. Section one collected background information of the learner. Each of the three sections collected data on the availability of teaching and learning resources (such as calculators, books, time), learner's attitude towards mathematics alternative B curriculum and methods commonly used by teachers in class to teach mathematics. The questionnaire comprised both close-ended and open-ended items.

3.5.3 Teaching and learning resource check-list

A checklist is a prepared list of items used by the researcher to gather important facts such as textbooks and instructional procedures for educational surveys (Koul, 1994). In this study a checklist was used to establish the availability of items such textbooks, mathematical tables, charts, probability kit, teaching aides, geometrical sets, models and calculators.

3.5.4 Document analysis guide

Document analysis was used to ascertain whether there is difference in performance in mathematics since the introduction of mathematics alternative B curriculum. School documents collected for further analysis included school KCSE results for 2010 and 2009 mathematics alternative B curriculum.
3.6 Pilot study

Before the actual data was collected, the researcher conducted a pilot study (Mugenda and Mugenda, 2003). Sixteen (2 directors, 4 teachers and 10 learners respondents were randomly selected) for the pilot study. The purpose of the pilot study was to enable the researcher to ascertain the validity of the instruments and to familiarize the researcher with the administration of the questionnaires and improve the instruments and procedures.

3.6.1 Validity of the research instruments

Validity is the degree to which a test measures what it purports to measure (Borg and Gall, 1989). The pilot study helped to improve face validity of the research instruments. According to Koul (1994), content validity of an instrument is improved through expert judgment. As such, the researcher sought the assistance of the supervisors, who, as experts in research, helped improve content validity of the instruments.

3.6.2 Reliability of the research instruments

Reliability is a measure of the degree to which a research instrument yields consistent results or data after repeated trials (Mugenda and Mugenda, 2003). The test-retest technique of assessing the reliability of the research was used. The test-retest involved administrating the same instrument twice to the same group of subjects at the same condition after a lapse of two weeks. Manual scoring was performed on the two scores for the two sets of questionnaires. A comparison between the scores in the first administration of the questionnaires
and the second was obtained through using the coefficient alpha as proposed by Cronbach’s (1951). The coefficient alpha generates a coefficient of internal consistency ranging from 0 to 1.0. The following formula was used:

\[ \alpha = \left( \frac{n}{n - 1} \right) \times \left( \frac{S^2_t - \Sigma S^2}{S^2_t} \right) \]

Where;

\( \alpha \) = estimated reliability of the test
\( n \) = number of test items
\( S^2_t \) = variance of the whole test (standard deviation squared)
\( \Sigma S^2 \) = sum of the variance for all \( n \) items.

The correlation coefficient that was obtained represented the reliability of only one test of the instrument. In order to obtain the reliability of the entire instrument, the Cronbach's alpha formula was used. A coefficient of 0.842 for directors’ questionnaire, 0.621 for mathematics teachers and 0.792 for students’ questionnaire was obtained. When all scales were combined Cronbach's alpha coefficient of 0.725 was obtained. The instruments were declared to be reliable. According to Gay (1981), any research instrument with a correlation coefficient between 0.7 and 1.0 is accepted as reliable enough.

3.7 Data collection procedure

The researcher sought a research permit to conduct research in Embakasi district from the Ministry of Higher Education Science and Technology through the National Council of Science and Technology. The researcher then booked appointments with various schools to administer questionnaire to, directors/principals, teachers and students. Different respondents were
grouped differently, the aim of the research was explained in details and the respondents were assured of confidentiality of their identities. The respondents were allowed to complete the questionnaire. The researcher then used a prepared check-list to make some observation on the availability of teaching and learning resources. Data on school KCSE performance was obtained from Nairobi province quality assurance offices for further analysis.

3.8 Data analysis techniques

The purpose of data analysis is to find meaning in data (Burns, 2000). Data analysis involves the process of sorting the data, coding, cleaning and processing and results interpretation (Kamindo, 2008). Data were analysed both qualitatively and quantitatively. Descriptive statistics such as statistics frequency distribution, percentages and inferential statistics such as regression analysis, with the aid of computer software Statistical Package for Social Sciences (SPSS version 17) were used to analyse data. Likert scale questions were analysed by use of weighted mean. Qualitative data were analysed by the use of content analysis which involves a systematic, replicable technique for compressing many words of text into fewer content categories (Coolican, 1994).
CHAPTER FOUR

DATA ANALYSIS, INTERPRETATION AND DISCUSSION OF FINDINGS

4.1 Introduction

This chapter covers analysis of data and the findings of the study. The main objective of the study was to assess the implementation of mathematics alternative 'B' curriculum in secondary schools in Embakasi District. The first section of the chapter presents the demographic data of the respondents. Section two presents data on teaching and instructional methods used in the implementation of mathematics alternative B curriculum in secondary schools. Section three presents data on academic and professional qualification of teachers implementing mathematics alternative B curriculum in secondary schools. Section four presents data on adequacy of learning and teaching resources on implementation of mathematics alternative B curriculum in secondary schools. Finally, section five presents data on learners' attitude toward mathematics alternative B curriculum in secondary school in Embakasi district.

4.1.1 Questionnaire response rate

The study targeted 14 teachers, 9 principal and 340 students in collecting data with regard to implementation of mathematics alternative 'B' curriculum in secondary schools in Embakasi district, Kenya. From the study, 12 teachers, 8 principals/directors and 340 students out of the 14 teachers, 9 principal and
340 students filled-in and returned the questionnaires making a response rate of 99.2 percent.

4.2 Demographic information of the respondents

Demographic information in this chapter included the personal information of directors/principals, teachers and that of students. It consists of the gender, age and experience of the respondents. Table 4.1 illustrates the gender of the respondents.

4.2.1 Gender of the respondents

The researcher administered the questionnaires to both male and female. Therefore, the study sought to find out the gender of the respondents. This was important in specifying the exact number of male and female respondents. The data are presented in table 4.1.

Table 4.1

<table>
<thead>
<tr>
<th>Gender</th>
<th>Principals/directors</th>
<th>Teachers</th>
<th>Students</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FQ</td>
<td>Percent</td>
<td>FQ</td>
</tr>
<tr>
<td>Male</td>
<td>5</td>
<td>62.5</td>
<td>8</td>
</tr>
<tr>
<td>Female</td>
<td>3</td>
<td>37.5</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>8</td>
<td>100</td>
<td>12</td>
</tr>
</tbody>
</table>

According to the findings, 62.5 percent of the principals were male and 37.5 percent were female. Sixty six (66.7%) of the teachers were male while 33.3 percent were female. This data reveals a disproportionately high gender disparity in mathematics teachers in favour of male teachers. More over 52.9 percent of the students were male while 47.1 percent were female.
4.2.2 Age of the respondents

The study was conducted to a cross section of respondents with a range of different ages. The study sought to find out the age of the respondents. Table 4.2 presents the age of the respondents.

Table 4.2

Age of the respondents

<table>
<thead>
<tr>
<th>Age in years</th>
<th>Students</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FQ</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>15-18</td>
<td>216</td>
<td>63.5</td>
<td></td>
</tr>
<tr>
<td>19-25</td>
<td>10</td>
<td>2.9</td>
<td></td>
</tr>
<tr>
<td>25 and above</td>
<td>114</td>
<td>33.5</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>340</strong></td>
<td><strong>100.0</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age in years</th>
<th>Principals/directors</th>
<th></th>
<th></th>
<th>Teachers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FQ</td>
<td>%</td>
<td>FQ</td>
<td>%</td>
</tr>
<tr>
<td>20-30 years</td>
<td>0</td>
<td>00</td>
<td>3</td>
<td>25</td>
</tr>
<tr>
<td>31-40 years</td>
<td>2</td>
<td>25</td>
<td>3</td>
<td>25</td>
</tr>
<tr>
<td>41-50 years</td>
<td>4</td>
<td>50</td>
<td>4</td>
<td>33.3</td>
</tr>
<tr>
<td>Above 50 years</td>
<td>2</td>
<td>25</td>
<td>2</td>
<td>16.7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>**8</td>
<td>100</td>
<td>**12</td>
<td>100**</td>
</tr>
</tbody>
</table>

As per the results, majority (50%) of the directors/principals were aged 41-50 years. This is a reflection that most of the principals had experience in administrative matter and had experience in curriculum implementation. The results also show that of the teachers 33.3 percent were aged 41-50 years while
25 percent were aged 20-30 years. In addition, 96 percent of the students were aged 15-18 years.

Directors/principals and teachers of different ages correspondents with their different skills and experiences in implementing new curriculum programmes and use of different methods of teaching. Students too were of different age, some students taking mathematics alternative B curriculum being private students with advanced age, this may have impacted on the implementation and performance of the students in mathematics.

4.2.3 Experience of the principals/directors

It was important to determine the experience of the directors/principals and teachers in the implementation of curriculum. Principals and directors were therefore asked to indicate their work experience in the schools. The responses are shown in Figure 4.1. Figure 4.1

**Distribution of directors and principals by experience**

![Bar chart showing distribution of directors and principals by experience](chart.png)

Regarding, the period the respondents had been a principal, 3 (37.5%) of the respondents had been principals for 16-20 years, 2 (25%) of the respondents
had been principals for 1-5 years, 2 (25%) of the respondents had been principals for over 20 years and one (12.5%) of the respondent had been principal for 11-15 years. Based on these results, it can be concluded that majority of the respondents had worked for a long time, so they had enough experience on the implementation of curriculum in schools in general, and were in a position to give the researcher useful insights about the challenges experienced in the implementation of mathematics alternative B curriculum in secondary schools.

4.2.4 Period the students had been in the school

Student’s attendance is likely to influence the way a student learns and this affects the implementation of the mathematics alternative B curriculum. It is against this background that the researcher sought to find out the period that learners had been in the school. Period the students had been in the school is shown in Figure 4.2.

Figure 4.1

Period the students had been in the school
From the findings, 59.3 percent of the students had been in the school for four years and 30.5 percent of the students had been in the school for three years. This means that majority of students were attending school regularly. Ten percent (10.2 %) had been in the school for two years, the majority of whom were private students who receive instruction outside formal education setting.

### 4.2.5 The ratio of private students

The researcher administered the questionnaire to schools that implemented mathematics alternative B curriculum. In this both regular and private students were involved in the study. It was important because to find out the number of private students since mast student attend school part time and therefore this might have affected the implementation of mathematics alternative B curriculum. Figure 4.3 illustrates the ratio of students who were private candidates and those who were not.

**Figure 4.2**

**Responses as to whether students were private or regular**

![Pie chart showing the ratio of private and regular students](image)
As indicated by the results, the majority (66.5%) of the students were regular students while 33.5 percent were private candidates. Those who were private candidates did not have adequate time to study thus this might have affected the implementation and performance of mathematics alternative B curriculum.

4.3 Teaching and instructional methods used in teaching mathematics alternative B curriculum

The instructional methods or techniques used by a mathematics teacher in class to give instructions promotes or hinders student’s achievement in mathematics (Peterson, 1999). Therefore, the study sought to find out the extent to which teaching methods were used by mathematics teacher to teach learners mathematics alternative B curriculum. Teachers were asked to state the extent to which used the various methods to give mathematics instructions in class. This is illustrated in Table 4.3.

Table 4.3

Teaching and instructional methods used by mathematics teachers to give instructions to learners

<table>
<thead>
<tr>
<th>Teaching Method</th>
<th>Very large extent</th>
<th>Large extent</th>
<th>moderate extent</th>
<th>Small extent</th>
<th>No extent</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organized</td>
<td>0</td>
<td>1</td>
<td>5</td>
<td>5</td>
<td>1</td>
<td>2.5</td>
</tr>
<tr>
<td>Lessons</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>6</td>
<td>0</td>
<td>3.1</td>
</tr>
<tr>
<td>Questioning</td>
<td>3</td>
<td>7</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>4.1</td>
</tr>
<tr>
<td>Explanation</td>
<td>4</td>
<td>6</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>4.1</td>
</tr>
<tr>
<td>Demonstration</td>
<td>0</td>
<td>1</td>
<td>7</td>
<td>3</td>
<td>1</td>
<td>2.7</td>
</tr>
<tr>
<td>Discussion groups</td>
<td>1</td>
<td>4</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>3.3</td>
</tr>
<tr>
<td>Guided discussions</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>3</td>
<td>2.8</td>
</tr>
</tbody>
</table>
According to the findings, the majority of mathematics teachers used explanation and demonstration teaching methods to teach mathematics. It was observed that teachers preferred these methods since the whole class was involved in the discussion and teacher could cover the syllabus on time.

It was further noted that although discussion groups is one of the teaching techniques that enhance performance in mathematics (Wasiche, 2006) it was used to moderate extent. This is because it was perceived as time consuming method to use and, although this method involved learners in the learning process most students who felt they were poor in mathematics tended to be passive. This finding concurs with Reynolds and Muijis (1999) observation. According to Reynolds and Muijis, students that perceived themselves to be poor in mathematics did not participate fully in the process of learning mathematics in group discussions where other students seem to understand mathematics better. These students ended up being passive during the process of learning which contributed to poor performance in mathematics.

4.3.1 Teachers’ opinion the effectiveness teaching methods used in class

It was important to know whether teachers were experiencing difficulty when deciding on which method to use when giving mathematics instructions to learners. Therefore, teachers were asked to indicate whether the methods they used were effective. Figure 4.4 shows teachers opinion on whether the method was effective in teaching mathematics.
Effective teaching methods used in class

The majority of the teachers 83.3 percent indicated that the teaching methods used in class were effective. This implies of mathematics teachers continued to use methods they used to despite mathematics despite the change of the syllabus. Sixteen point seven percent (16.7 %) of the teachers stated that the teaching methods used in class were not effective. According to the teachers’ response appropriate methods were not used due to factors such as lack of enough time, resources such as books, low motivation among students and lack of basic skills to teach students perceived to be poor in mathematics and teachers. According to Thijs (1999), poor teaching method such as lecture method were common in classroom because, teachers lacked confidence, mastery of subject matter content and basic teaching skills.

In addition, the researcher conducted a linear regression analysis so as to test relationship among variables (independent) on the performance of mathematics B curriculum. The researcher applied R to code, enter and compute the measurements of the linear regressions for the study. The results are presented in table 4.4.
Table 4.4

Model Summary

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Squared</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.80⁵</td>
<td>.64</td>
<td>.232</td>
<td>.4211</td>
</tr>
</tbody>
</table>

Coefficient of determination explains the extent to which changes in the dependent variable can be explained by the change in the independent variables or the percentage of variation in the dependent variable (performance of mathematics B curriculum) that is explained by all the teaching and instructional methods used by teachers. The four independent variables that were studied, explained 64 percent of the performance of mathematics alternative B curriculum as represented by the R².

Table 4.5 ANOVA

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of Squares</th>
<th>Df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>2.434</td>
<td>3</td>
<td>1.103</td>
<td>47.421</td>
<td>007</td>
</tr>
<tr>
<td>Residual</td>
<td>7.307</td>
<td>9</td>
<td>2.452</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>4.326</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Results indicated that a value of .007 was less than 0.05 thus the model was not statistically significance in predicting performance of mathematics alternative B curriculum. Table 4.5 presents the model summary.
The researcher conducted a linear regression analysis so as to determine the effect of the independent variables (organized lessons, questioning, explanation, demonstration, discussion groups, guided discussions and brainstorming) on the dependent variable (performance of mathematics curriculum B). As per the R generated table above, the equation \( Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \varepsilon \) becomes:

Where \( Y \) is the dependent variable ((performance of mathematics curriculum B), \( X_1 \) is the Organized lessons variable, \( X_2 \) is Questioning variable, \( X_3 \) is Explanation variable, \( X_4 \) is Demonstration variable, \( X_5 \) is Discussion groups variable, \( X_6 \) is Guided discussions variable, \( X_7 \) is Brainstorming variable.

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>0.24</td>
</tr>
<tr>
<td>(Constant)</td>
<td>1.000</td>
<td>1.036</td>
<td>0.842</td>
<td>7</td>
</tr>
<tr>
<td>Organized lessons</td>
<td>0.621</td>
<td>0.096</td>
<td>0.215</td>
<td>0.342</td>
</tr>
<tr>
<td>Questioning</td>
<td>0.746</td>
<td>0.145</td>
<td>0.087</td>
<td>0.578</td>
</tr>
<tr>
<td>Explanation</td>
<td>0.906</td>
<td>0.068</td>
<td>0.155</td>
<td>0.96</td>
</tr>
<tr>
<td>Demonstration</td>
<td>0.312</td>
<td>0.057</td>
<td>0.121</td>
<td>0.211</td>
</tr>
<tr>
<td>Discussion groups</td>
<td>0.812</td>
<td>0.145</td>
<td>0.087</td>
<td>0.578</td>
</tr>
<tr>
<td>Guided discussions</td>
<td>0.971</td>
<td>0.012</td>
<td>0.162</td>
<td>0.014</td>
</tr>
<tr>
<td>Brainstorming</td>
<td>0.044</td>
<td>0.314</td>
<td>0.412</td>
<td>1.003</td>
</tr>
</tbody>
</table>
According to the regression equation established, taking all factors into account at constant at zero, performance of mathematics alternative B curriculum was 1.000.

The data findings analyzed show that taking all other independent variables at zero, discussion groups and guided discussions method of giving instruction in mathematics lesson will lead to a 0.812 and 0.971 increase in performance of mathematics alternative B subject. This showed that guided discussions contributes more to the performance in mathematics followed by the explanation, while demonstration contributing the least. At 5% level of significance and 95% level of confidence, Guided discussions had a 0.001 level of significance and demonstration showed a 0.06 level of significance, hence the most significant factor is guided discussions.

4.4 Academic and professional qualification of the respondents

High quality teaching is the leverage point for improving how student can effectively learn mathematics. According to Kelwon (1991) and Liu and Linggi (2009) successful implementation of innovation is possible when there are combined concrete teacher and principal-specific training activities, ongoing continuous assistance and support during the process of implementation. The headteachers were asked to indicate their professional qualifications. Their responses indicated that 62.5 percent of the principals had attained a B.ED as the highest level of academic qualification and 37.5 percent had attained masters as the highest level of academic qualification. This implies
that the principals had the right qualification to implement the program new curriculum program (Ondiek, 2009).

4.4.1 Highest academic qualification of the mathematics teachers

Studies have found that teachers' qualification corresponds positively with students' achievement in mathematics (Betts, Zau and Rice (2003). The study sought to find out the qualification of teachers implementing mathematics alternative B curriculum. Teachers were asked to indicate their highest academic qualifications. Figure 4.5 illustrates the highest academic qualification of mathematics teachers implementing mathematics alternative B curriculum.

Figure 4.4

Highest academic qualification of the mathematics teachers

According to teachers' response results, 66.7 percent of the teachers had attained a bachelors degree with mathematics as their major subject of teaching, 14.3 percent had attained a masters degree, 16.7 percent had attained
a diploma and 2.4% had secondary school certificate. Majority of the teachers were qualified to teach mathematics alternative B curriculum. Studies in teacher preparation have shown that students of teachers with mathematics degree or mathematics education degree demonstrated higher academic achievement in mathematics (Wilson and Floden, 2003).

**4.4.2 Principals’ in-service training on implementation of the mathematics alternative B curriculum**

Overall curriculum implementation in a school depends on effective supervision by school administration, management and the school principal (Republic of Kenya, 2010). According to Berman and McLanghlin (1976), active involvement of the principal during implementation of curriculum depended on whether the principal attended workshop training session or not. There is a general agreement that principals are also involved in overcoming initial resistance of the staff and foster teachers’ professional growth for the sake of the implementation of the curriculum. It is for this reason that the study sought to find out whether the principals were in-serviced before the implementation of mathematics alternative B curriculum in their schools. From the findings, all (100%) of the principals had not attended in-service training relevant to implementation of the mathematics alternative B curriculum.
4.5 Directors/principal response on the availability of teaching and learning resources

According to Crossley and Murby (1994) school effectiveness is a linked to direct material input such as textbooks. It is difficult to envisage learning without resource such as textbooks, non books material and other learning environment that provides a learning experience to a learner. Indeed highly competent teachers will find it difficult to teach effectively in inadequate facilities and if they lack necessary instructional material (Cohn & Rossmillar, 1987). Against this background, there was need to find out whether the schools implementing mathematics alternative B curriculum had enough resource. These results are illustrated in Figure 4.6

**Figure 4.5**

**Director/principals' opinion on adequacy of learning and teaching resources to implement mathematics alternative B curriculum**

![Pie chart showing 62.8% inadequate and 37.2% adequate]

As indicated by the results in the chart above, 62.8 percent of the principals rated availability of learning resources for teaching mathematics alternative B curriculum at the school as inadequate while 37.2 percent rated as adequate. This resonates with Menoe (2006) observation. According Manoe, the
4.4.3 Mathematics teacher in-service training related to the implementation of mathematics alternative B curriculum

Teacher in-service refers to the opportunity offered practicing teachers to develop new knowledge, skills, approaches and disposition to improve their effectiveness in classroom. The study sought to find out whether mathematics teachers had in-service training the mathematics alternative B curriculum. According to the teachers response although none of respondents had undergone any in-service training related to the implementation of mathematics alternative B curriculum, the majority of the respondents had undergone in-service related to teaching of mathematics subject. Findings indicate that 66.7 percent of the respondents had attended Strengthening of Mathematics and Science in Secondary Education (SMASSE) In-service Education and Training (INSET). However, 33.3 percent of the respondents had not attended any form of INSET.

Most of teachers who had not attended SMASS INSET were from private schools and those that were newly employed teachers. According to Kelwon (1991) and Liu and Linggi (2009), successful implementation of innovation is possible when there are combined concrete teacher-specific training activities, on-going continuous assistance and support during the process of implementation.
majority of schools that opted to implement Standard Grade (SG) mathematics course less advance mathematics course for secondary schools in South Africa rather than grade (HG) an advanced mathematics course, had serious problem with regard to human resource, facilities, and equipment to promote effective learning and teaching. It is not surprising when the results were poor. Inadequate teaching and learning resources for the implementation of the new education programme, means there is a gap in actual classroom practice.

4.5.1 Directors and principals response to the availability of mathematics teachers during the implementation of mathematics alternative B curriculum

The findings by (Conrad and Chitturi, 1995) identified mathematics teachers in school as one of the most suitable partner in accomplishing the implementation process of the curriculum. Shortage of mathematics teachers is likely to affect the implementation and performance in mathematics subject. The study sought to find out the turnover of mathematics teachers in the schools that implement mathematics alternative B curriculum. Figure 4.7 presents the results.
From the findings, 62 percent of the principals indicated that there was high turnover of mathematics teachers in the school while 38 percent indicated they were not regular. This is a reflection that there is shortage of teachers to teach mathematics in schools. According to Ronfeldt, Lankford, Loeb, and Wyckoff (2009), teacher turnover harms student learning process. Brykand and Schneider (2002) argue that the quality of relationships (trust) between teachers, and between teachers and students, is related to student achievement. The degree to which that turnover disrupts the formation or maintenance of these relationships may also harm student achievement.
4.5.1 Director/principal opinion on students performance in mathematics alternative B curriculum

The main objective of introducing mathematics alternative B curriculum to secondary schools is to tackle poor performance in mathematics by students in KCSE examination. It is for this reason that the study sought to find out the directors/principals opinion about the issue. Data revealed that half of the principals indicated that performance of mathematics had improved, while the other half indicated that performance had not improved. This may be attributed to principals attitude towards mathematics alternative B curriculum and schools' special circumstance such as previous performance and expectation to perform better in mathematics alternative B curriculum.

4.6 Teachers' opinion on the adequacy of learning and teaching resources in schools

Inadequate materials, space and equipment are the main problem to implementation of any curriculum in schools and greatly affect performance in mathematics examination. Teachers were therefore, asked to respond to a number of questions in order to establish whether schools were experiencing problems during the implementation of curriculum due to lack of essential teaching and learning resource. The response is illustrated in Table 4.9.
## Table 4.7

Teachers’ response with regard to the adequacy of teaching and learning materials

<table>
<thead>
<tr>
<th>Statements</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly disagree</th>
<th>mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning resources are adequate</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>1.9</td>
</tr>
<tr>
<td>Learning resources are made available on time</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>3</td>
<td>2.3</td>
</tr>
</tbody>
</table>

The respondents indicated that their schools did not have the curriculum support materials needed for effective implementation of mathematics alternative B curriculum, besides this most of the materials especially books were not provided on time therefore mathematics teachers used the previous mathematics alternative A curriculum books to teach. Indeed most of the schools were already experiencing difficulties in the teaching of mathematics as a result of the shortage of teaching materials. The broad category of education-related resources includes textbooks, instructional guides, calculators; practice exercises books, activities, tests, and reference materials both in classroom and at home (Kelwon, 1991; Meyer and Nassamoto, 2008). Teaching materials should be made available on time.
4.5.2 Response on adequacy of teaching and learning resources

The researcher used the prepared school resource checklist to find out the availability of specific resources necessary for the implementation of curriculum. Table 4.10 illustrates the results.

Table 4.8

Adequacy of teaching and learning resources

<table>
<thead>
<tr>
<th>Resources</th>
<th>Yes</th>
<th>No</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teaching-learning aids in Mathematics e.g. models</td>
<td>32.1</td>
<td>68.9</td>
<td>1.3</td>
</tr>
<tr>
<td>Mathematics alternative B Text books (Teachers)</td>
<td>12.6</td>
<td>87.4</td>
<td>1.1</td>
</tr>
<tr>
<td>Mathematics alternative B Text books (Students)</td>
<td>8.3</td>
<td>91.7</td>
<td>1.1</td>
</tr>
<tr>
<td>Reference materials</td>
<td>21.8</td>
<td>78.2</td>
<td>1.2</td>
</tr>
<tr>
<td>Syllabuses</td>
<td>94.8</td>
<td>5.2</td>
<td>1.9</td>
</tr>
<tr>
<td>Calculators</td>
<td>45.8</td>
<td>54.2</td>
<td>1.5</td>
</tr>
<tr>
<td>Mathematical tables</td>
<td>46.3</td>
<td>53.7</td>
<td>1.5</td>
</tr>
<tr>
<td>Geometrical sets</td>
<td>75.4</td>
<td>24.6</td>
<td>1.8</td>
</tr>
</tbody>
</table>

According to the information obtained through the use of checklist, most schools implementing mathematics alternative B curriculum did not have enough teaching and learning resources. This implies that schools were not adequately prepared to implement the new mathematics alternative B curriculum. This concurs with the teachers' observation about the availability of teaching and learning material to implement mathematics alternative B curriculum. The only teaching and learning resources available and adequately provided for were the geometrical sets and mathematics syllabus. Although textbooks are recognized as a critical component of giving instruction
(Abadzi, 2006) majority of the schools did not have adequate mathematics textbooks for learners and teachers.

4.7 Learners’ attitude towards mathematics alternative B curriculum

Student attitudes about mathematics and their attitudes about their ability in mathematics have been recognized as a predictor of mathematics achievement. One of the objective of the development and implementation of mathematics alternative is to foster positive attitude towards mathematics. It is for this reason that this study sought to investigate the learners’ attitude towards mathematics alternative B curriculum. Table 4.14 illustrates the learners’ response.

Table 4.9

Learners’ attitude towards mathematics alternative B curriculum

<table>
<thead>
<tr>
<th>Statement</th>
<th>Yes</th>
<th>No</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics was interesting</td>
<td>100</td>
<td>240</td>
<td>1.3</td>
</tr>
<tr>
<td>Fairly interesting</td>
<td>200</td>
<td>140</td>
<td>1.6</td>
</tr>
<tr>
<td>Not interesting</td>
<td>40</td>
<td>300</td>
<td>1.1</td>
</tr>
<tr>
<td>I like mathematics alternative B curriculum</td>
<td>240</td>
<td>100</td>
<td>1.7</td>
</tr>
<tr>
<td>I think mathematics alternative A is difficult</td>
<td>300</td>
<td>40</td>
<td>1.9</td>
</tr>
<tr>
<td>Mathematics alternative B is simpler</td>
<td>250</td>
<td>90</td>
<td>1.7</td>
</tr>
<tr>
<td>Mathematics alternative A curriculum is for strong students</td>
<td>300</td>
<td>40</td>
<td>1.9</td>
</tr>
<tr>
<td>Mathematics alternative B curriculum is for weak students</td>
<td>320</td>
<td>20</td>
<td>1.9</td>
</tr>
<tr>
<td>Mathematics a B is substandard</td>
<td>280</td>
<td>60</td>
<td>1.8</td>
</tr>
<tr>
<td>Alternative Mathematics is relevant for my future career</td>
<td>100</td>
<td>240</td>
<td>1.3</td>
</tr>
</tbody>
</table>
According to the findings, students disagreed that mathematics was interesting as shown by a mean of 1.3, students agreed that mathematics was fairly interesting as shown by a mean of 1.6, students disagreed that mathematics was not interesting as shown by a mean of 1.1, students stated that they liked mathematics alternative B subject as shown by a mean of 1.7, students thought mathematics alternative A was difficult, students stated that mathematics alternative B is simpler, students stated that mathematics alternative A curriculum is for strong students as shown, students stated that mathematics alternative B subject is for weak students, some students thought mathematics B is substandard as shown by a mean of 1.9 and students disagreed that mathematics alternative B curriculum is relevant for my future career as shown by a mean of 1.3. It was observed that learners had positive attitude towards mathematics B curriculum.

4.7.1 Challenges facing the implementation of mathematics alternative B curriculum

Directors /principals and teachers were asked to state challenges facing the implementation mathematics alternative B curriculum. The majority of the directors /principals cited the ministry of education policy on the implementation of mathematics alternative B curriculum as the major obstacle facing the implementation of this subject. This is where schools are not allowed to offer the two options in the same school. In addition to this, there was the directive that schools wishing to offer alternative ‘B’ must get
clearance from the Director of Quality Assurance and Standards (Ministry of Education)

Lack of teaching resources was the main obstacle to the implementation of the alternative curriculum. The respondents indicated that their schools did not have the curriculum support materials needed for the effective teaching and learning of this subject. Another challenge to the implementation was the general attitude towards the curriculum. It was observed that the majority of mathematics teachers who are trained to teach pure mathematics and some parents felt that the curriculum is substandard. Among the students, there was stigma associating those who had chosen the curriculum for being weak.

4.7.2 Suggestions on how to improve the implementation of the curriculum in future

Respondents were asked to make suggestions on how to improve the implementation. Most the respondents saw the need to create awareness and orientation among members of the society and implementers to discourage the stigma that associates the mathematics alternative B curriculum with lower intelligence. Others respondents observed that there is no difference between the two mathematics A and B curricula in terms of difficulty and suggested that the level of difficulty be checked in order for the curriculum to meet its objectives. Respondents suggested that before the implementation of any new curriculum there should be wide consultation with stakeholders. This is the only way that would ensure that the content of the curriculum responds to the needs of learners and society in general.
4.8 Summary of the analysis

This chapter has presented the analysis of the data as collected by means of research instruments discussed in chapter three. The analyses are presented using distribution tables, pie charts and bar graphs. These include data on the questionnaire return rate and demographic information of the respondents. In an attempt to answer the research questions, the analysis of the data collected is organized and presented in six major sub-headings. Finally the summary of the chapter four is provided.
CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents a summary of the findings, conclusion and recommendations of the study based on the research objectives of the study. It also gives suggestions for further research.

5.2 Summary of the study

The purpose of the study was to assess the implementation of mathematics alternative 'B' curriculum in secondary schools in Embakasi district in Nairobi. Four research objectives guided the study. The research objectives sought to establish the teaching and instructional methods being used in the implementation of mathematics alternative B curriculum; assess academic and professional qualifications of teachers implementing mathematics alternative B curriculum; establish the adequacy of learning and teaching resources in the implementation of mathematics alternative B curriculum. Finally, the study sought to determine learners' attitudes toward mathematics alternative B curriculum and how it influences the implementation of mathematics curriculum in secondary schools in Embakasi district.

This study provides the background of the study against which the study was carried out. The background of study gives the rationale behind having two mathematics curricula for students of different abilities. Countries with several mathematics curricula to cater for the needs of learners of different abilities,
interest and aptitude are discussed. The statement of the problem, the objectives of the study, the purpose and significance of the study are discussed. The limitation, the delimitation and the assumptions of the study are also highlighted. The final section of chapter one captures the definitions of significant terms and briefly describes the organization of the study.

In addition to this, the study presents an overview of the literature related to the study. Theoretical and conceptual frameworks to the study are also discussed. The research design used in the study, target population, sample size and sampling procedures have been explained. The description of the research instruments used, pilot study, measures of testing instrument reliability and validity, the procedure of the collection and analysis of data are also provided.

This study adopted descriptive survey design. The sample comprised of 9 principals/directors, 14 teachers and 340 students. Questionnaires for directors and secondary school principals, mathematics teachers and learners', a checklist and document analysis guide were used to collect data. Data were analysed by use of descriptive and inferential statistics (regression analysis) with the aid of computer software Statistical Package for Social Sciences (SPSS version 17). The analysis of data and the findings of the study have also been done. Finally the study presents the summary of the findings, conclusion and recommendations and suggestions for further research.
5.2 Summary of key findings

Based on the findings, the study revealed that the mathematics teachers used a variety of techniques such as organized lessons, questioning, discussion groups, guided discussions and brainstorming to teach mathematics, however, explanation and demonstration as methods of teaching were preferred by most of the teachers.

The study established that directors, principals and mathematics teachers implementing mathematics alternative B curriculum had the right academic qualifications to implement mathematics alternative B curriculum effectively. It was found that curriculum implementers were not in-serviced before the implementation of mathematics alternative B curriculum.

Findings further revealed that learning resources for teaching mathematics alternative B curriculum were inadequate or not available at all. Learning resources were not made available to teachers on time. Teacher shortage was an obstacle to the implementation of mathematics alternative B curriculum.

The study further found that the students viewed mathematics as fairly interesting and had positive attitude towards mathematics alternative B subject.

5.2 Conclusion

The study concluded that schools were not adequately prepared to implement the mathematics alternative B curriculum. This is because teaching methods employed by the mathematics were more teachers-centered. Method such as
group discussion which promoted active learning in mathematics was not commonly used in classroom. Some of the respondents found it difficult to use certain method due to lack of adequate teaching and learning materials such as books and time. Lack of in-service training for by implementers of mathematics alternative B curriculum by the Kenya Institute of Education is clear indication that there was inadequate preparation for the implementation of mathematics alternative B curriculum.

The findings of the study indicate that the implementation of mathematics alternative B curriculum faced many challenges including critical shortage of teaching and learning resources, lack of the mathematics teachers due to higher teacher turnover among teaching staff. There was a general negative attitude toward mathematics alternative B curriculum by teachers, administrators and students. Finally, lack of preparedness by most of the schools to implement mathematics alternative B curriculum the might have led to poor performance in this subject.

5.4 Recommendations

Based on the analysis of the study the researcher wishes to make the following recommendation;

i. The study recommends that Kenya Institute of Education initiate an in-service for teachers implementing this curriculum now. This will help to change the teachers' attitude towards this curriculum and improve teachers' classroom practices and enhance performance in mathematics alternative B curriculum.
ii. All education stakeholders who include school administration, teachers, education officers, parents and students should encourage students struggling with mathematics study mathematics alternative B curriculum. This will help in improving the perception of students on the subject.

iii. The Ministry of Education and the department of quality assurance and standards should create awareness and orientation among members of the society and implementers to discourage the stigma that associates the alternative curriculum and with lower intelligence. This will be through changing the policy that has negatively affected the attitude of

iv. Shortage of learning and teaching resources was identified as one of the major obstacles to the implementation of the mathematics alternative B curriculum. Therefore, school administration should prioritize the provision of facilities and resources needed for the implementation of mathematics alternative B curriculum as soon as possible. This will motivate the students and teachers to engage in learning this subject leading to improved performance in this subject

v. Higher education institutions such as universities should immediately come up with the training program for teachers for mathematics alternative B curriculum. This will enable teachers to handle learners struggling with mathematic as it is the case in Singapore.
5.5 Suggestions for further research

In this study a number of issues could not be comprehensively covered because of a wide range of limitation hence the following areas were suggested to further study

1. The study was carried in an urban setting. It is important that a similar study carried in other districts to find out if the same findings will be obtained.

2. A longitudinal study should be done to find out whether the two cohorts of learners that opted for mathematics alternative B subject face any challenge in career choice, development and when seeking for employment in the job market.
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Awad, F. (2008). The influence of parents’ culture on students’ choice of mathematics: Study in senior years school of education and social work the University of Sydney Australia.


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Vocational education and training in Finland (2004).


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University of Nairobi
P.O. Box 30197
NAIROBI
10/07/2012

Dear Sir/Madam,

RE: ASSESSMENT OF THE IMPLEMENTATION OF
MATHEMATICS ALTERNATIVE B CURRICULUM IN SECONDARY
SCHOOLS IN EMBAKASI DISTRICT

I am a post graduate student at the University of Nairobi pursuing a Master of Education Degree in Education Administration and Planning. I am conducting a research on the above topic. The purpose of this study is to assess the implementation of Mathematics Alternative B Curriculum in Embakasi District.

Kindly respond to the questionnaire given as correctly and honestly as possible. Please note that information given will be handled in a confidential and professional manner. When responses and data are released, they will be reported in summary form only and no identifying information will be included in any discussion of the results. You're requested not to write your name or that of the institution anywhere on the questionnaire.

Thank you.

Yours sincerely,

Ngugi, David
APPENDIX II

QUESTIONNAIRE FOR THEDIRECTOR

The purpose of this questionnaire is to gather information about the implementation of mathematics alternative B curriculum in Embakasi District. You are kindly requested to answer the questions as honestly as possible. Do not indicate your name or that of your school on this questionnaire. Your response will be treated with utmost confidentiality.

(Tick appropriately where applicable)

PART A: DEMOGRAPHIC INFORMATION


PART B: ACADEMIC AND PROFESSIONAL QUALIFICATIONS


Others [6] please specify the course_________________

4. Have you attended any training relevant to implementation of the mathematics alternative B curriculum e.g. in-service/orientation/workshop Yes [1] No [2]

5. If yes, how effective were the courses you have attended in facilitating the implementation of mathematics alternative B curriculum?

6. In your opinion what challenges do you face as principal during the implementation of mathematics alternative B curriculum in your school? E.g. lack of text books, time for private students, learners attitude e.t.c

SECTION C: TEACHING AND LEARNING RESOURCES:

7. How can you rate the availability of learning resources for teaching mathematics alternative B curriculum at the school? Very adequate [1]


9. Do your teachers of mathematics attend INSETs e.g. SMASSE, workshops, seminars, orientation e.t.c Yes [1] No [2]

10. What is the turnover of mathematics teachers in your school?
    Very high (more than 1 in every year) [1] High (1 in 2 years) [2] Average (1 in 3 years) [3] Low turnover (1 in 5 years) [4]


12. In your opinion what measures can be put in place to enable teachers and students to embrace the new syllabus positively?


PART D: TEACHING METHODOLOGIES

From your observation state the extent to which the following teaching methods are used by mathematics teacher to teach learners. Indicate on the scale of: key1 = very frequently; 2 = frequently; 3 = sometimes; 4 = Rarely; 5 = Not at all as indicated on the table.

<table>
<thead>
<tr>
<th>15</th>
<th>Teaching Methods</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>Lecture</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Use of examples</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Problem solving</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Teacher Demonstration</td>
<td></td>
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</tr>
<tr>
<td>20</td>
<td>Group discussion</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>21</td>
<td>Individual work</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Questioning technique</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Others (specify)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Others please

24. Specify

25. Give suggestions on how performance in mathematics can be improved

Thank you for time spent to respond to the questions above
APPENDIX III

QUESTIONNAIRES FOR MATHEMATICS TEACHERS

The purpose of this study is to assess the implementation of mathematics alternative B curriculum in secondary school in Embakasi District. You are kindly requested to answer the questions as honestly as possible. Do not indicate your name or that of your school on this questionnaire. Your response will be treated with utmost confidentiality.

PART A: DEMOGRAPHIC INFORMATION

(Tick appropriately where applicable)


3. How long have taught mathematics (Tick number of years)

PART B: ACADEMIC AND PROFESSIONAL QUALIFICATIONS

4. What is your highest academic qualification? SI/Dip Ed [ ] B Ed(A)
   B Ed (sc) [ ] M Ed [ ] PhD [ ] Others[ ]

5. Have you attended any training relevant to the implementation of the mathematics alternative B curriculum e.g in-service/orientation/workshop/seminar Yes [ 1] No [ 2 ]
6. If yes, how effective were the courses you have attended in facilitating the implementation of mathematics alternative B curriculum in class?


PART C: TEACHING METHODOLOGIES

7. State the extent to which you use the following teaching methods to teach mathematics. Indicate on the scale of: key 1= very frequently; 2=frequently;3=sometimes; 4=Rarely;5=Not at all as indicated on the table

<table>
<thead>
<tr>
<th>Teaching Methods</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use of examples</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Problem solving</td>
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<tr>
<td>Teacher demonstration</td>
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<tr>
<td>Discussion groups</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Individual work</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Questioning technique</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Others (specify)</td>
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<td></td>
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</tr>
</tbody>
</table>
8. According to your view what is the learner’s attitude towards mathematics alternative B curriculum? Positive [ ] Neutral[ ] Negative [ ]

9. Has the performance improved since the introduction of mathematics alternative B curriculum Yes[ ] No [ ]

**PART D: TEACHING AND LEARNING MATERIALS**

Please indicate the availability of the teaching and learning materials.

<table>
<thead>
<tr>
<th>Learning resources</th>
<th>Adequate</th>
<th>Inadequate</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 Teaching/learning aids e.g. models</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 Mathematics alternative B text books</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 Mathematics alternative B reference books</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13 Syllabuses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14 Calculators</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 Mathematical tables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16 Library</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17 Geometrical sets</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

18. Have you been experiencing problems in implementing mathematics curriculum due to lack of learning and teaching materials before ____

19. What are challenges of implementing mathematics alternative B curriculum ____
20. How can the implementation of mathematics alternative B improved?_____ 

Thank you for time spent to respond to the questions above.
APPENDIX IV

QUESTIONNAIRE FOR THE LEARNER

This questionnaire is designed to gather information from students about mathematics alternative B. Do not write your name or that of your school anywhere in this paper.

PART A: Demographic Information

1. Indicate your gender (a) Male [ ] (b) Female [ ]
2. Age 15-18[ ] 19-25[ ] 25-above
3. I am a private candidate yes[ ] No[ ]

PART B: Availability of Learning Materials.

5. Which mathematics text book do you use in class
   a) Old mathematics textbooks[ ]
   b) New mathematics alternative B textbook [ ]

Please indicate if you have the following as a student and in school in general.

<table>
<thead>
<tr>
<th>Learning resource</th>
<th>Available</th>
<th>Not adequate</th>
<th>Accessible</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 Mathematics alternative B text books</td>
<td></td>
<td></td>
<td>Yes No</td>
</tr>
<tr>
<td>7 Mathematics B reference books</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 Calculators</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 Geometrical sets</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 Mathematical tables</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 Library</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
PART C: Students attitude towards mathematics alternative B

<table>
<thead>
<tr>
<th>Statement</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>12  Mathematics is interesting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13  Fairly interesting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14  Not interesting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15  I like Mathematics Alternative B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16  I think mathematics alternative A subject is difficult</td>
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<tr>
<td>17  Mathematics alternative B subject is simpler</td>
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<tr>
<td>18  Mathematics alternative A subject is for strong students</td>
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<tr>
<td>19  Mathematics alternative B curriculum is for weak students</td>
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<tr>
<td>20  Mathematics B is substandard</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21  Alternative Mathematics is relevant for my future career</td>
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<td></td>
</tr>
</tbody>
</table>

23. Give suggestions on how we can improve the performance in mathematics ___________

Thank you for time spent to respond to the questions above.
### APPENDIX V

#### CHECK-LIST: TEACHING AND LEARNING RESOURCES AND MATERIALS

<table>
<thead>
<tr>
<th>Teaching and learning resources</th>
<th>Available Yes/ No</th>
<th>Adequate Yes No</th>
<th>accessible Yes No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teaching-learning aids in</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mathematics e.g. models</td>
<td></td>
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</tr>
<tr>
<td>Mathematics alternative</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>B Text books (Teachers)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Mathematics alternative</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B Text books (Students)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reference materials</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Charts</td>
<td></td>
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<tr>
<td>Syllabuses</td>
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<tr>
<td>Calculators</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Mathematical tables</td>
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<tr>
<td>Library</td>
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<tr>
<td>Geometrical sets</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
NCST/RCD/14/012/759

David Ngugi
University of Nairobi
P.O.Box 30197-00100
Nairobi.

RE: RESEARCH AUTHORIZATION.

Following your application for authority to carry out research on "An assessment of the implementation of mathematics alternative B curriculum in secondary schools in Embakasi District, Kenya," I am pleased to inform you that you have been authorized to undertake research in Embakasi District for a period ending 31st July, 2012.

You are advised to report to the District Commissioner and the District Education Officer, Embakasi District before embarking on the research project.

On completion of the research, you are expected to submit two hard copies and one soft copy in pdf of the research report/thesis to our office.

DR. M. K. RUGUTT, PhD HSc.
DEPUTY COUNCIL SECRETARY

Copy to:

The District Commissioner
The District Education Officer
Embakasi District.
APPENDIX VII

RESEARCH AUTHORIZATION

THIS IS TO CERTIFY THAT
Prof. Dr. Mr. Mrs. Miss / Institution
David Ngugi
of (Address) University of Nairobi
P.O.Box 30197-00100, Nairobi
has been permitted to conduct research in
Location
Embakasi
District
Nairobi
Province

on the topic: An assessment of the implementation of mathematics alternative B curriculum in secondary schools in Embakasi District, Kenya

for a period ending: 31st July, 2012

Research Permit No: NCSIT/RGD/14/012/7 898
Date of issue
20th June, 2012
Fee received
KSH 1,000

Applicant's Signature

Secretary
National Council for Science & Technology