INSTRUCTIONAL RELATED FACTORS AND STUDENTS' PERFORMANCE IN MATHEMATICS AT KENYA CERTIFICATE OF SECONDARY EDUCATION IN PUBLIC SECONDARY SCHOOLS, NJIRU SUB-COUNTY, KENYA

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DECLARATION

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

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E55/81739/2015

This project has been submitted for examination with our proposal as university supervisors.
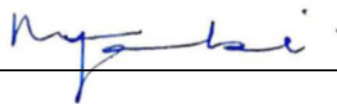
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DEDICATION

This project is dedicated to the memory of my late father, Fahri Kucuk, my beloved wife Rahime Asuman Kucuk and my children, Hatice Kucuk, Perihan Safiye Kucuk and Betul Bahar Kucuk.

ACKNOWLEDGEMENTS

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ABBREVIATIONS AND ACRONMYMS

ASEI   Activity, Student, Experiment, and Improvisation

CPD   Continuously Professional Development

KCSE   Kenya Certificate of Secondary Education

KICD   Kenya Institute of Curriculum Development

KLB   Kenya Literature Bureau

KNEC   Kenya National Examination Council

MoEST   Ministry of Education, Science and Technology

NACOSTI   National Council for Science and Technology

OECD   Organisation for Economic Co-operation and Development

PDSI   Plan, Do, See and Improve

SbTD   School-based Teacher Development

SMASSE   Strengthening Mathematics and Sciences in Secondary Education

SPSS   Statistical Package for Social Sciences

ABSTRACT

The purpose of this study was to establish factors influencing students'
performance in Mathematics in Kenya Certificate of Secondary Education in
public secondary schools in Njiru sub-county, Kenya. The research objectives
were to establish the influence of teaching methods on performance of the
students in mathematics in KCSE examinations in the public secondary schools
in Njiru Sub-county; to determine the influence of availability of the teaching
and learning resources on performance of the students in mathematics in KCSE
examinations in the public secondary schools in Njiru Sub-county, to determine
the influence of utilization of the teaching and learning resources on
performance of the students in mathematics in KCSE examinations in the public
secondary schools in Njiru Sub-county, to establish the influence of attitude of
the learners towards mathematics on performance of the students in
mathematics in KCSE examinations in the public secondary schools in Njiru
Sub-county, to establish the influence of attitude of the teachers towards
mathematics on performance of the students in mathematics in KCSE
examinations in the public secondary schools in Njiru Sub-county.The study
adopted ex post facto design and targeted 12 principals, 42 Mathematics
teachers and 111 form four students in Njiru sub-county. Simple random
sampling technique was used to select the respondents. Data was collected by
use of questionnaires, interview and observation checklist and analyzed by use
of descriptive statistics. Findings postulated that non-availability and
inadequacy of teaching and learning resources, students' negative attitudes,
teacher centered methods hindered performance in mathematics. The study is
suggesting that future studies should be examining the validity of the findings
in all schools in Nairobi City County to establish the factors behind poor
performance in Mathematics.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

As man develops his technology and masters his environment mathematics becomes essential and therefore mathematics importance becomes much higher compared to before as claimed by Karigi and Tumuti (2015). They say that utilization of mathematics plays a vital role in advancement of science and technology. Moreover, it is the subject that is considered as the mother of all learning and, both art and science subjects get their concepts from it.

Mathematics is a tool for understanding structures, relationships and patterns of its concepts, therefore, producing solutions for complex real life problems. Ezenweani (2006) describes mathematics as a body of knowledge that mankind struggles to improve his/her perception and his/her immediate environment through utilization of clear, logical precise and exact thinking processes. Yadav (2017) denotes that mathematics is scientific study of quantities whose relationships, operations and measurements are shown by numbers and symbols.

According to Mbugua, Kibet, Muthaa and Nkonke (2012) mathematics is the foundation of the technological knowledge that is essential for the social-economic development of a nation. It is an important subject that not only facilitates the academic qualifications but also prepares learners for their future. It can be used to identify the truth level of a fact and inspires human beings to use their mind effectively. It facilitates the mankind to solve their problems

logically and wisely. Therefore, mathematics is a core and compulsory subject in both primary and secondary schools levels in many countries in the world. Mathematics is a crucial requirement for admission into competitive courses in universities and hence performing well in mathematics at secondary school level examinations is very important and necessary.

However, students' achievement in this vital subject over the years has not been encouraging at the primary, secondary and university levels of education in the world. Students' poor performance in national examination remains a major concern worldwide and Kenya in particular as stated by Karigi and Tumuti (2015). Teachers, students, parents, curriculum developers and the public have tended to blame one another for the poor performance in mathematics at secondary school level. In an attempt to respond to this problem, mathematics scholars have carried out many studies in mathematics education.

VaniaMa and Xin Ma, (2014) argue that international comparative studies have consistently shown that students in the United State of America (USA) lag behind students in other developed countries in mathematics performance. What is more, Mata, Monteiro, and Peixoto, (2012) state that Portuguese students do not perform as well as expected, and they under achieve in mathematics and languages when compared to students from other countries in the for Economic Co-operation and Development (OECD). According to a study done in Turkey by Uysal, (2015) the average performance of Turkish students is relatively poor when compared to other OECD countries in mathematics. The mathematics performance in Africa including Kenya has been poor for all the years. Maliki,

Ngban and Ibu, (2009) say the performance in mathematics has been a matter of serious concern to all well- meaning educators in Nigeria. What is more, according to the statistics by the Ministry of Education Science and Technology students' mathematics performance of Kenya Certificate of Secondary Education (KCSE) has an average below 27% for the last five years and this average is very low (MoEST, 2019). There are several instructional factors contributing the performance of the mathematics subject and therefore this study will try to find out some of these factors at the end. These factors are the elements that influence the transfer of the learning of mathematics from a teacher to a student.

Mata, Monteiro, and Peixoto, (2012) state that among student variables, attitudes are regarded as key factor to be taken into account when attempting to understand and explain variability in student performance in mathematics. In another study, Cote and Levine, (2000); Singh, Granville and Dika, (2002) cited in Godwin (2015) say that studies have shown that factors like motivation and attitude have affected students' performance. What is more, Schenkel (2009) claims that teachers who are more enthusiastic and have a more positive attitude about teaching mathematics have students whose attitude about the subject is more positive.

According to Uchechi (2013) good instructional strategies are able to increase the success of students in mathematics. In addition, according to Rasmussen and Marrongelle (2006), it is crucial for educators to embrace instructional design methods to accomplish higher achievement grades in mathematics. According

to a study conducted in Nairobi at the secondary schools by Ali (2013) alteration in mathematics performance was influenced significantly by the type of teaching strategy.

Mugure (2012), Wanjiku (2013) and Atieno (2014) say that adequacy and utilization of teaching and learning resources have been seen to be very important in determining the achievement of students in the national examinations. What is more, Najumbe(2013) and Matimbe(2014) say that it is impossible to have meaningful teaching and learning in the schools in the absence of teaching and learning materials. Therefore, as mentioned by the scholars, there are several instructional factors that influence the mathematics performance of the students in secondary school level and some of these factors were examined in this study.

Table 1. 1: Mathematics Performance in KCSE from 2014 to 2018

Year	Paper I Mean Score (%)	Paper II Mean Score (%)	Overall Mean Score (%)
2014	24.54	24.50	24.52
2015	25.53	28.23	26.88
2016	23.74	17.84	20.78
2017	24.49	26.47	25.48
2018	24.07	28.82	26.44

Source: (MoEST, 2019)

According to the statistics by the Ministry of Education Science and Technology the mathematics performance in KCSE examinations is very low in the entire country as seen in the Table 1.1 (MoEST, 2019). From the Table 1.1 the

performance of mathematics for the last five years has an average mean score below 27 percent and it does not show an incremental trend but a fluctuating curve. This is a worrying trend and it likely to fail the country from achieving its Vision 2030 of becoming industrialized. For any country to be industrialized mathematics and science is key.

Table 1. 2 KCSE Results Average for English, Kiswahili & Mathematics from 2014 to 2018 in Nairobi County

Year/Subject	English	Kiswahili	Mathematics
2014	5.7	4.6	4.1
2015	5.8	5.4	4.1
2017	3.8	3.3	2.7
2018	4.1	3.4	2.8

Source: (MoEST, 2019)

The averages given are out of 12 and according to Ministry of Education Science and Technology the pass mark average is 7(C+) out of 12(A). As seen in the Table 1.2 the mathematics performance is very low compared to pass mark average. Moreover, according to available data the students' performance of mathematics subject in Nairobi City County compared to other core subjects is lower from year 2014 to year 2018 in KCSE examinations as seen in the Table 1.2.

Table 1. 3 : Performance of Mathematics in Nairobi Sub-counties

SUBCOUNTY	AVE.(2017)	AVE.(2018)
Westlands	4.8	4.8
Starehe	3.8	3.4
Njiru	2.0	2.0
Makadara	3.4	3.6
Langata	4.0	4.2
Kasarani	2.1	2.2
Kamukunji	2.8	3.1
Embakasi	2.2	2.4
Dagoretti	2.0	2.1
Nairobi City County	2.7	2.8

Source: (MoEST, 2019)

Not surprisingly, according to available data from the Ministry of Education, Science and Technology the students' performance of mathematics is 2.0 and 2.0 out of 12 in Njiru Sub-county in Nairobi in KCSE examinations in the years 2017 and 2018 respectively which is very low as seen in the Table 1.3. The mathematics performance in KCSE examinations in Njiru Sub-county is the lowest performance compared to the other sub-counties in Nairobi City County. Njiru Sub-county is a semi urban sub-county in Nairobi City County.

The mathematics teachers, mathematics educators, parents, students and ministry continue seeking ways to improve the performance in this subject. In order to improve mathematics performance, the Ministry of Education Science and Technology has been putting several measures. The key measures among

them are Strengthening Mathematics and Sciences in Secondary Education (SMASSE), ASEI (Activity, Student, Experiment, and Improvisation), PDSI (Plan, Do, See and Improve), the school-based teacher development (SbTD) programme, and Continuously Professional Development (CPD) programme.

Despite all these measures which have been put in place, still not much has been achieved to improve performance in mathematics and the influence of the instructional factors peculiar to this study are not singled out in studies. Accordingly, this study sought to investigate the instructional factors influencing the mathematics performance of the students in KCSE examinations in Njiru Sub-county in Nairobi City County to yield adequate information to the review of the curriculum for the improvement of the mathematics performance in this sub-county.

1.2 Statement of the Problem

Mathematics is an important subject that not only facilitates the academic qualifications but also prepares learners for their future as argued by Mbugua, Kibet, Muthaa & Nkonke (2012). However, as mentioned before the performance in mathematics subject is not encouraging in all counties including Nairobi City County and its sub-counties. In Njiru sub-county, students' mathematics performance is the lowest performance compared to the one in the other sub-counties in Nairobi City County. Although several studies have been done to determine the reasons for poor mathematics performance in secondary school level as stated by Karigi and Tumuti (2015) the authentic causes of poor performance are not found yet. Moreover, Oyugi (2018) cites that poor

performance in mathematics in KCSE examinations in Njiru sub-county has been a major challenge to education stakeholders. Naturally more studies should be done to determine the reasons for poor performance in mathematics and hence the purpose of this study sought to examine the instructional factors influencing performance of the mathematics in Kenya Certificate of Secondary Education (KCSE) examinations in the public schools in Njiru Sub-county.

1.3 Purpose of the Study

The purpose of the study was to investigate the instructional related factors influencing performance of the mathematics in KCSE examinations in public schools in Njiru Sub-county, Kenya.

1.4 Objectives of the Study

The study was guided by the following objectives.

i.   To establish the influence of teaching methods on performance of the students in mathematics in KCSE examinations in the public secondary schools in Njiru Sub-county.

ii. To determine the influence of availability of the teaching and learning resources on performance of the students in mathematics in KCSE examinations in the public secondary schools in Njiru Sub-county.

iii. To determine the influence of utilization of the teaching and learning resources on performance of the students in mathematics in KCSE examinations in the public secondary schools in Njiru Sub-county.

iv. To establish the influence of attitude of the learners towards mathematics on performance of the students in mathematics in KCSE examinations in the public secondary schools in Njiru Sub-county.

v. To establish the influence of attitude of the teachers towards mathematics on performance of the students in mathematics in KCSE examinations in the public secondary schools in Njiru Sub-county.

1.5 Research Questions

The study was guided by the following research questions.

i. To what extent do the teaching methods influence the performance of the students in mathematics in KCSE examinations in the public secondary schools in Njiru Sub-county?

ii. How does availability of the teaching and learning resources influence the performance of the students in mathematics in KCSE examinations in the public secondary schools in Njiru Sub-county?

iii. How does utilization of the teaching and learning resources influence the performance of the students in mathematics in KCSE examinations in the public secondary schools in Njiru Sub-county?

iv. To what extent does attitude of the learners towards mathematics influence the performance of the students in mathematics in KCSE examinations in the public secondary schools in Njiru Sub-county?

v. To what extent does attitude of the teachers towards mathematics influence the performance of the students in mathematics in KCSE examinations in the public secondary schools in Njiru Sub-county?

1.6 Significance of the Study

The study is important because it may provide information to curriculum developers at Kenya Institute of Curriculum Development (KICD) to review the curriculum of the mathematics in secondary school level. Also, it is important because it may assist teachers to improve their teaching methods, students to have positive attitudes towards mathematics and administrators to avail teaching and learning resources to improve the mathematics performance of the students in KCSE examinations in Njiru Sub-county. Moreover, it may guide the future researches by opening more research gaps in the field of education, particularly instructional factors influencing the mathematics performance of the students in KCSE examinations in Njiru Sub-county.

1.7 Limitations of the Study

Some of the respondents of the study would have given responses to cover their weaknesses and safeguard their interests. Some respondents had filled the questionnaires reluctantly. Moreover, the graduates whose KCSE results inspired this investigation were not accessible as they were out of the school; therefore, in this study form 4 students were respondents, a limitation, based on ex post facto design. However, the findings of this research could be used as a reference study for further educational research.

1.8 Delimitations of the Study

The study limited itself to only one sub-county in the entire county, Njiru sub-county because the mathematics performance in this sub-county is the lowest among other sub counties in Nairobi County. Only principals, mathematics

teachers and form four students were respondents and only public secondary schools in Njiru sub-county was studied because they strictly follow the mathematics curriculum given by KICD relatively. Similarly, there are several factors that influence mathematics performance in KCSE, however, only few instructional factors were examined because of the nature of the study.

1.9 Assumptions of the Study

The followings were the basic assumptions of the study.

i.   The KCSE examination results are valid and reliable measurement tools to compare examination performances of the high and low achievers.

ii. All form four students already have covered mathematics syllabus before they sit for their KCSE mathematics exams.

1.10 Definition of Significant Terms in the Study

The following terms have been defined as used in the study.

Influence refers to the power to have an important effect on someone or something.

Instructional related factor refers to aspects that influence the mathematics performance of the students.

Performance of mathematics refers to students' mathematics achievement scores obtained in examinations.

Student attitude refers to a generalized feeling or a perception of a student towards a particular object, subject, event or a situation.

Teacher attitude refers to a generalized feeling or a perception of a teacher towards a particular object, subject, event or a situation.

Teaching and learning resources refer to the resources that teachers use to deliver instruction.

Teaching method refers to different instructional ways which teachers use to deliver a body of knowledge, skills, attitudes, morals, values and norms in a given manner of study to students.

1.11 Organization of the Study

The study comprised of five chapters and chapter one is the introduction which consists of background to the study, statement of the problem, purpose of the study, research objectives, research questions, and significance of the study, limitation and delimitation of the study and assumptions of the study. Chapter two comprises of the literature review and contains introduction, student performance in mathematics in KCSE, discussion of variables used in research including teaching methods, attitudes of the learners, and attitudes of teachers towards mathematics, availability and utilization of teaching and learning resources, summary of literature review, theoretical framework and conceptual framework. Third chapter is the research methodology. It consists of research design, target population, sample size and sampling procedures, research instruments, validity and reliability of the instruments, data collection and data analysis techniques and ethical considerations. Chapter four contains data analysis, presentation and interpretation. Chapter five includes summary of study, conclusions and recommendations and suggestions for further study were also presented.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter comprises of literature review which includes the students' performance in Kenya certificate of secondary education (KCSE), the literature review on the instructional factors; teaching methods, attitude of teachers and attitudes of students towards mathematics and availability and utilization of the teaching and learning resources that influence the performance of mathematics in secondary schools, summary of the literature review, theoretical and conceptual frameworks.

2.2 Students' Performance in Mathematics in Kenya Certificate of Secondary Education (KCSE)

Academic performance can be defined as the accomplishment of short- or long-term educational objectives. According to Aremu (2003) poor performance is a performance that is below an expected standard and in order to measure the performance of the students the external or public examinations are given to the examinees/testees. According to, Ross and Genevois (2006) the public or external examinations have been used to assess the students' performance at the end of secondary schooling in many countries in Africa, Asia, Latin America and Europe since long time ago.

Yara (2011) states that examinations are used to measure the candidates' achievements level and determine candidates' level of education, training and

employment in Kenya. The mathematics performance in KCSE is graded from A (plain), highest grade, to E, lowest grade, and the pass mark grade is C (plus). The results of KCSE examinations are used to evaluate and review the curriculum both at local and national level by Kenya Institute of Curriculum Development (KICD). The examinations facilitate to select the students who are eligible to proceed to the next stage of education as stated by Sifuna (2010) and improve quality of teaching and learning process and hence improve the performance of the students in external examinations.

There are several constraints of the public examinations done nationally particularly in Kenya. Bregman and Stallmeister, (2002) claim that due to the national examinations, the teachers, administrators and students do not follow the national curriculum instead they realize their teaching and learning based on the examinations and this enhances rote learning. The content and skills covered in schools are totally based on the coverage of the syllabus of the Kenya National Examination Council (KNEC). The skills and content covered in KNEC examinations are taught and the teachers use past papers to teach students during the class time and the ones not covered in the exams are overlooked.

2.3 Teaching Methods and Students' Performance in Mathematics

Farrell and Farmer cited in Salman (2012) describe the teaching method as a pattern of teaching modes designed to promote the achievement of a particular learning outcome. The choice of teaching method depends on the content, student's level of understanding, class demographic structure, teacher's

philosophy of education, teacher's style of teaching and mission of the school. Ozturk and Saritas (2009) express that to enhance high achievements of objectives, innovative and exploring instructional approaches and techniques should be provided. National Council of Teachers of Mathematics (2000) argued that although there has been fundamental shift in teaching and instruction techniques, teachers should not wholly forget the traditional instructional methods since they still impact on learners. New instructional techniques such as peer teacher teaching and learner exploration should be merged with traditional methods such as group discussion, problem solving and student inquiry.

The teacher centered method like lecturing method does not encourage students to interconnect among the concepts of mathematics and this method is defined by Callahan and Clark (2007) as the method of teaching where teacher delivers knowledge verbally to learner. Wekesa (2013) says that the information learned through lecture method is easily forgotten. She argues that due to nature of mathematics the teachers should not use pure lecture method rather they should use student centered teaching methods.

Student centered teaching methods are teaching methods where students involve themselves in mathematics activities fully to achieve the objectives. These methods are discussions, group technique, demonstration, brain storming, project and practical class activities as mentioned by Wekesa (2013). The student-centered teaching methods recommended by the Ministry of Education Science and Technology are discussion, class activities, class experiments,

questions and answers and project work as stated in Kenya Literature Bureau (KLB) Teacher's Guide Book (2016).

The Cockcraft committee (2014) say that student centered methods require: explanation by the teacher, discussion between teacher and students and students among themselves, suitable practical class activities, integration and practice of basic skills, problem solving, application of mathematics to real life situations and exploration work. The committee claims that these methods of teaching are effective when the most appropriate learning resources are utilized. Therefore, teachers should identify required resources in advance and develop a clear procedure for role of teaching. Forester (2000) says that practical class activities increase understanding of mathematics. In these methods teachers are facilitators, guide the process, measure the challenge and give feedback to each student or a group as mentioned by Gordon, Rogers, Comfort, Gavula& McGee (2001) and Herring & Evans (2005) cited in Nganga (2011). This study sought the impacts of these teaching methods to yield information about the poor performance of the students in mathematics in public secondary schools in Njiru sub-county.

2.4 Availability of Teaching and Learning Resources and Students' Performance in Mathematics

Mathematics lessons are more effective when required resources are available. Such resources can be text books, teaching aids, computers, time and even human resource. Oyugi (2018) says that performance of students in any subject is remarkably influenced by avaliabilty and utilization of resources. Studies

done by Mbugua, Kibet, Nkonke & Muthaa (2012) have shown that the avaliabilty and utilization of textbooks affect the performance of mathematics.

Obwocha (2005) noted that lack of resources in schools contribute to poor performance across the country. He noted that in majority of schools that performed dismally in the national examinations had inadequacy in terms of teaching and learning resources including lack of enough teachers. Studies by Schiefelbein and Farnell (1973) as cited by Rosenthal (2007) in Chile on availability of textbooks and their influence on performance found a positive correlation between textbooks and academic achievement.

Kalunda and Otanga (2015) denote that physical facilities like classrooms, desks, chairs, libraries and toilets play a key role on academic achievement. Bray cited in Kipyegon (2013) argues that with adequate learning resources students are able to cover the syllabus in time and hence perform better in KCSE mathematics examinations.

2.5 Utilization of Teaching and Learning Resources and Students' Performance in Mathematics

Baldacchino and Farrugia (2002) argued that the quality of education is not only improved through availing physical resources such as text books but also by the way teachers and students utilize the availed resources. The teacher should create a conducive learning environment and guide learners to utilize the resources in the best possible ways. Teachers are expected to utilize the local materials as students learn better with the ones that they are familiar with. The

general materials utilized in secondary schools are textbooks, mathematics geometrical sets, colored chalks, calculators, mathematical charts and models, computers, teaching aids, revision materials and mathematical tables as noted by Mbugua, Kibet, Nkonke & Muthaa (2012) and Mutai (2010).

Wekesa(2013) says that the learning materials should be selected by the teachers according to the suitability and relevance of the content to be delivered. She continues to say that utilization of media is essential in the teaching of mathematics and enhances achievement and strengthening the skills regarding observation, listening, imagination and communication. This study sought to establish whether the avaliability and utilization of teaching and learning resources to provide information to explain the reason for poor performance in KCSE mathematics in public secondary schools in Njiru sub-county.

2.6 Students' Attitude towards Mathematics and Their Performance in Mathematics

Mensah, Okyero and Kuranchie (2013) say that attitude refers to a positive or negative emotional tendency towards a stimuli and formation of attitude is experiental but not innate. It is generally believed that students' attitude towards a subject determines their success in that subject. Enu, Agyman and Nkumu (2015) say that students' positive attitude towards mathematics increases level of their efforts putting toward learning the subject. Constant poor results in mathematics lead to students losing hope and also losing interest in the subject. On the other hand, students who excel in mathematics develop positive attitudes towards the subject and acts as a motivator towards mathematics related career.

Mutodi and Ngirande (2014) say that the unfavorable images and stories about mathematics among students are prevailing and many students perceive mathematics as a cold, abstract and difficult subject. However, Nandwa, Wasike and Wanjala (2015) ascertain that once the structures of mathematics are explored by the learners then they learn mathematics easily.

In their study, Farooq and Shah (2008) in Pakistan state that in secondary school level the girls don not engage themselves in mathematics classes and activities because of their negative perceptions about mathematics. However, according to Kimball cited in Saritas and Akdemir (2009) girls tend to perform better than males in mathematics. On the other hand, boys perform better than girls in Kenya (MoEST, 2019). This study investigated the factors that affect the perceptions of students towards mathematics and that cause discrepancies in mathematics performance among boys and girls in public schools in Njiru sub-county.

2.7 Teachers' Attitude towards Mathematics and Students' Performance in Mathematics

The outcomes of the education system are achieved through the effectiveness of the teachers and without teachers it is not possible to accomplish any tangible outcomes as postulated by Salman (2012). Teachers play a crucial role in imparting the knowledge in education system; naturally, Odiri (2011) argues that students will learn if teachers have positive attitudes towards their teaching whereas teacher's negative attitude hinders teaching and learning of mathematics. In his study, Mutai (2010) ascertains that the teacher's attitude

influences the attitude of the learner and the learner will learn the subject according to the presentation of the teacher. He says that the teachers should teach, reinforce and motivate their students according to their individual differences.

Mensah, Okyere and Kuranchie (2013) argue that teachers can build confidence in their students by encouraging them to believe that they can perform well in mathematics; providing them various learning styles to learn the concepts on their own pace; assisting them to value the importance of mathematics in their lives and selecting the activities carefully according to their level of understanding and their preferences. Ogunniyi (2013) postulates that student's positive attitude towards mathematics is enhanced by teacher's enthusiasm, resourcefulness and helpful behavior, pedagogy, thorough expertise of the subject matter, and ability to make mathematics interesting. This study investigated the activities done by teachers and their qualifications that make students to have positive attitude towards mathematics and hence perform well in the subject.

2.8 Summary of Literature Review

As seen in the literature review, National Council of Mathematics (2000) say that teachers should not forget traditional teaching methods whereas Wekesa (2013) says mathematics teachers should not use pure lecture method. What is more, Farooq and Shah (2008) say that girls do not engage themselves in mathematics classes, however, Kimball cited in Saritas and Akdemir (2009) says that girls tend to perform better than males in mathematics. Moreover,

Baldacchino and Farrugia (2002) say that the avaliability of teaching and learning resources is not adequate for improvement of mathematics performance whereas Schiefelbein and Farnell (1973) cited in Rosenthal (2007) availability of textbooks affects students' mathematics positively. Also, Oyugi (2018) investigated only the influence of students' attitudes, teacher training and availability of teaching and learning resources in Njiru sub-county. Therefore, the scholars are inconsistent regarding the influence of the instructional factors in students' mathematics performance hence this study investigated influence of instructional factors in students' mathematics performance in this sub-county.

2.9 Theoretical Framework

This study was based on Bruner instructional learning theory. Bruner (1966) cited in McLeod (2019) notes that learners build their own knowledge on their own through organizing and categorizing information via a coding system. He maintains that for a learner to develop a coding system the most effective way is to explore it rather than being told by the teacher. He argues that teachers should not give knowledge directly to the students rather they should facilitate and guide learners to get the knowledge using their thinking and problem-solving skills. What is more, he says that a child can learn at any age; his/her cognitive structures develop as s/he grows; is active in learning process and can learn easily through the precise way of presentation and explanation by adults.

In this study, students' mathematics performance can be viewed as the knowledge and instructional factors as the presentations and explanations by the

teachers or adults. As the teacher uses appropriate teaching methodology and utilizes the teaching and learning resources wisely, the school administration avails teaching and learning resources and both students and teachers have positive attitudes towards mathematics the learners will perform well in mathematics. On the other hand, this theory does not support the cases where students are not ready to learn; their cognitive structures are not developed and they are not able to learn on their own. In this case, Bandura's (1977) social learning theory is more appropriate as the theory is based on the idea that we learn through interactions with others in our environment. Students learn through interactions among each other and adults when they are not ready to learn; their cognitive structures are not developed and they are not ready to learn.

2.10 Conceptual Framework

A conceptual framework is a model of presentation where a researcher conceptualizes or represents the relationships between independent and dependent variables in the study and shows the relationship graphically or diagrammatically (Orodho, 2008). The key variables in this study are categorized as independent and dependent variables as shown in the figure 2.1 which also includes variables which influence students' mathematics performance directly or indirectly. As seen in the figure 2.1, students' performance in mathematics subject totally relies on the provision of instructional factors. Ideal provision of instructional factors will result in high grades in KCSE mathematics.

Independent variables

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┌─────────────────────────────────────┐
│         Teaching methods             │
│  • Teacher centered teaching         │
│    methods                           │
│  • Student centered teaching         │
│    methods                           │
└─────────────────────────────────────┘

┌─────────────────────────────────────┐
│  Availability and utilization of     │
│  teaching & learning resources       │
│  • Textbooks, teaching and           │
│    learning materials                │
│  • Teachers and physical             │
│    facilities                        │
│  • Media and technology              │
└─────────────────────────────────────┘

┌─────────────────────────────────────┐
│  Attitude of learners and teachers   │
│                                      │
│  • Positive                          │
│  • Negative                          │
└─────────────────────────────────────┘
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┌──────────────┐          ┌──────────────────┐
│ Teaching and │          │ Students'        │
│ Learning     │   →      │ Performance of   │
│ Process      │          │ Mathematics      │
└──────────────┘          │                  │
                          │  • KCSE          │
                          │    Grades:       │
                          │    from          │
                          │    A(plain) to   │
                          │    E achieved,   │
                          │    where pass    │
                          │    mark is       │
                          │    C(plus)       │
                          └──────────────────┘
```

Figure 2.1 Relationships between Variables on Performance of Mathematics in KCSE

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter comprises of methodology which was used to collect data for the study. The chapter included research design, study target population, the sample size and sampling procedures, research instruments, validity and reliability for the instruments, data collection procedures, data analysis techniques and ethical considerations.

3.2 Research Design

The research study will use ex post facto design which is defined by Tuckman (1972) as an experiment in which a researcher studies the effects of an event happened already rather than creating the event itself. The graduates whose KCSE examination results inspired this study have already left the school so they will not be available for the study. However, the students present in the school will be included in the target population and this will enable to use ex post facto design method. Through this method data is collected and analyzed and patterns are extracted and the collected data is compared. This method will be used in this study because it will enable the researcher to collect information from a sample of students, mathematics teachers and principals in public secondary schools in Njiru Sub-county in Nairobi City County by use of questionnaires and interview schedule.

3.3 Target Population

The target population refers to an entire group of individuals, events or objects having common characteristics as noted by Mugenda and Mugenda (2003). The study targeted a population of 12 public secondary schools' staff handling mathematics as a subject to be respondents. There were totally 13 public secondary schools in Njiru Sub-county and one school did not have form four students so it was excluded from the study. 12 schools had a population of 1095 form four students, 42 mathematics teachers and 12 principals (MOEST, 2019). In the study, data was collected from staff handling mathematics in 12 public secondary schools in Njiru Sub-county. Since form four students were the most experienced students and they were about to finish secondary mathematics syllabus they were able to respond all the items in the instrument knowingly, therefore, they were chosen as student target population.

3.4 Sample Size and Sampling Procedure

Sampling is the way choosing units from a characterized population and these units are regarded as the representatives of the population. The sample comprised of form four students, mathematics teachers and principals of 12 public secondary schools in Njiru Sub-county. Gall & Borg (2003) say that in a research a sample of 10% - 30% is acceptable. Also, for a small population sample size is 20% and that of a large population is 10% as argued by Ary and Razarieth (2006) cited in Oyugi (2018). Therefore, 10 percent of form four students was selected from each school which translated to a total of 111 form four students to represent student population as shown in Table 3.1. The

selection of respondents was done through simple random sampling. Crossman (2020) says that simple random sampling method is the most common sampling design used in qualitative and quantitative researches. The names of form four students in each class registration was written on a piece of paper and the papers were folded and shaken in a closed container from which the required number in each school was picked.

Surbhi (2017) says that census is a research method where all members of population are included in the study. Using census sampling method, all the 42 mathematics teachers and 12 principals were included in the study. As seen in the Table 3.1 sample size is 111 form four students plus 54 teachers and principals which accounts to 14% of the target population.

Table 3. 1:Sample Size of Respondents in Njiru Sub- County

Name of school	No of math teachers	No of form four students	No of (Math Teachers/Head teachers)	Sample size 10% (form four students)
Dandora Girls	3	96	4	10
Dandora Secondary	5	209	6	21
Mihango	2	57	3	6
Dr Mwenje	4	99	5	10
Drumvale	4	86	5	9
Jehova Jireh	3	128	4	13
Muhuri Muchiri	5	111	6	11
Ruai Boys	3	49	4	5
Ruai Girls	3	58	4	6
St Georges Athi	3	48	4	5
Ushirika	5	104	6	10
St Dominics	2	50	3	5
Total			**54**	**111**

(MoEST, 2019)

3.5 Research Instruments

Best and Kahn (1999) and Orodho (2009) state that questionnaires facilitate the researcher to explain the purpose of the study and to explain the meaning of the items that may not be clear. Questionnaires are used to obtain vital information about the population as argued by Mugenda and Mugenda (2003). Both open

and closed items were used in the study to collect the data. The questionnaires were designed for students and mathematics teachers and comprised of questions seeking the background information, students' mathematics performance and assessing factors influencing performance of mathematics. The researcher used observation checklist to collect data. Kathuri and Pals (2012) note that observation technique collects information directly and this instrument facilitated to collect data regarding availability and utilization of teaching, learning and physical resources. Lastly, there was an interview schedule for the principals and interviews are good instruments to collect data regarding specific objectives of the study as stated by Mugenda and Mugenda. (2003).

3.5.1 Validity of Research Instruments

Orodho (2005) defines validity as the degree to which results obtained from the analysis of the data actually represent the phenomenon under study. Validity therefore checks if the research instruments are doing what they were intended to do. The questionnaires were submitted to the supervisors. The experts checked the details of this instrument and gave their guide to review the items for pilot study. As indicated by Mugenda and Mugenda (2003) 10% of sample is good for the pilot study, therefore, 11 form four students, mathematics teachers and the principal of a school in Dagoretti sub-county that had similar mathematics results in KCSE were picked as respondents for pilot study. Pilot study helped to make clarification and improved the content for use in the instrument that was adopted for the study.

3.5.2 Reliability of Research Instrument

Mugenda and Mugenda (2003) denoted that reliability is the extent to which an instrument will generate the same data after multiple applications under the same conditions. Once the questionnaire items are set according to study expectations fully, the questionnaire was given to 11 form four students and math teachers and the principal of pilot school in Time 1 and after two weeks the same procedure was repeated in Time 2. Test-retest method was used to assess the reliability on instruments.

3.6 Data Collection Procedure

The researcher sought an introduction letter from the University of Nairobi to carry out the study. Once obtained, the researcher acquired a research permit from the National Council for Science and Technology (NACOSTI) to undertake research and the permit legally allowed the researcher to conduct the study. Afterwards, the researcher informed Sub-county director of education office, Njiru Sub-county and wrote a letter of intent and requested to principals of schools participating. The researcher then visited the selected schools, made arrangements and distributed the questionnaires to mathematics teachers and students and did an interview with the principal. Once the instruments completed, they were collected on the same day.

3.7 Data Analysis techniques

Both qualitative and quantitative data were collected. The quantitative data collected from closed questions was coded and analyzed using descriptive

statistics. The qualitative data obtained from open ended questions and interview schedule was analyzed using conceptual content analysis. As cited in Wekesa (2013), Creswell (2003) states that the conceptual content analysis is a method of making elicitations through objective and systematic identification of specific characteristics of messages. Both quantitative and qualitative data was analyzed through Statistical Package for Social Sciences (SPSS) and tabulated and presented through simple frequencies, percentages, means and standard deviations. The information obtained from analysis was presented through bar charts, tables and pie charts.

3.8 Ethical Considerations

This study adhered to all the research ethics and before getting into the actual field work, the researcher sought permission from Ministry of Education, Science and Technology. Afterwards, the permission from Njiru Sub-county director of education and schools' management was requested to facilitate the researcher to conduct study in public secondary schools in this sub-county. Then the questionnaires were distributed and for the assurance of confidentiality the respondents were asked to omit their names on the questionnaire. The respondents were ensured that the information would be strictly confidential and used only for research purposes and any reference would not be made to schools or individuals.

CHAPTER FOUR

DATA ANALYSIS, INTERPRETATION AND DISCUSSION

4.1 Introduction

The purpose of the study was to find out the instructional related factors influencing students' KCSE mathematics performance in Njiru sub-county. The chapter introduces the findings of the study and makes reference to relevant research to support the findings of the study. The findings include demographic information about the sample, results obtained from the descriptive statistics for the instructional related factors influencing performance of the mathematics in KCSE examinations in public schools in Njiru Sub-county, Nairobi, Kenya. Prior to presentation of data, the response rate and background characteristics of the respondents are stated. Lastly, data analysis was done in the guidance of the objectives of the study:

1. To establish the influence of teaching methods on performance of the students in mathematics in KCSE examinations in the public secondary schools in Njiru Sub-county.

2. To determine the influence of availability of the teaching and learning resources on performance of the students in mathematics in KCSE examinations in the public secondary schools in Njiru Sub-county.

3. To determine the influence of utilization of the teaching and learning resources on performance of the students in mathematics in KCSE examinations in the public secondary schools in Njiru Sub-county.

4. To establish the influence of attitude of the learners towards mathematics on performance of the students in mathematics in KCSE examinations in the public secondary schools in Njiru Sub-county.

5. To establish the influence of attitude of the teachers towards mathematics on performance of the students in mathematics in KCSE examinations in the public secondary schools in Njiru Sub-county.

4.2 Questionnaires Return Rate

Completion rate is the proportion of sample that participated in all the research procedures.

Table 4: 1Questionnaires response rate

Category	Distributed Questionnaires	Returned Questionnaires	Percentage
Students	111	111	100
Math Teachers	42	42	100
Principals	12	12	100
Total	165	165	100

The results of response and completion rate are shown in Table 4.1. As seen in Table 4.1 all the questionnaires distributed were filled out and the response rate was 100%. In line with this response rate it is sufficient to make conclusions regarding the objectives of the study.

4.3 Distribution of Respondents

The distribution of respondents is vital for the success of the study. Figure 4.1 shows the distribution.
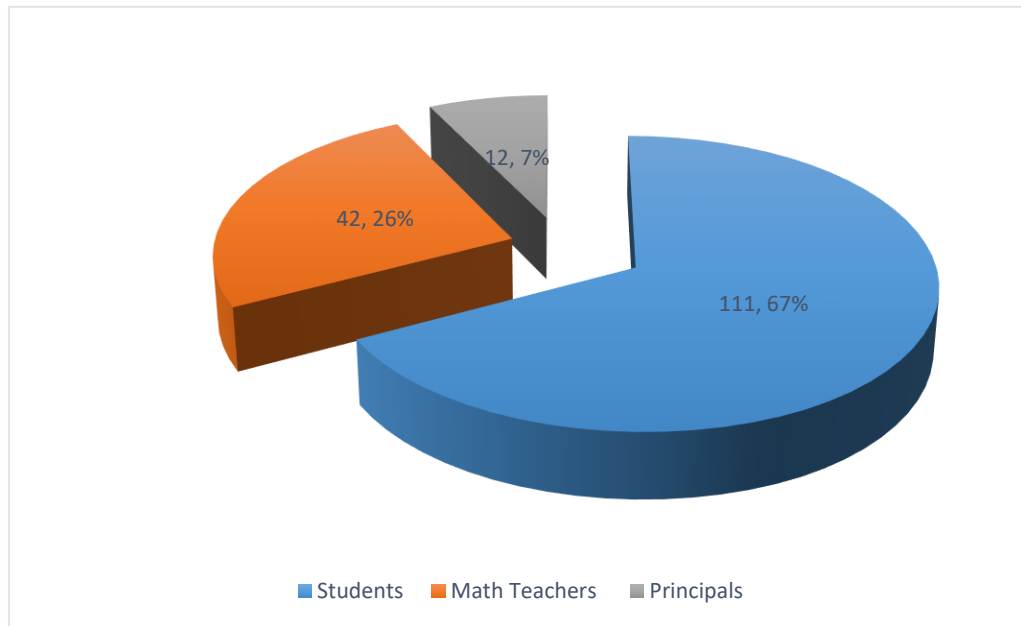
Figure 4.1 Distribution of respondents

Information presented in Figure 4.1 shows that the study population had a higher percentage of students (67%). This was so because students were the unit of analysis in this study.

4.4 Demographic Information

The characteristics of the respondents who participated in the study were gathered and analyzed. The results were based on the information collected on the questionnaire. The demographics did not affect the high-level analysis but provided general information about the study population. The traits were discussed in the section below.

4.4.1 Student demographic

As seen in Figure 4.2, 50.5% of the respondents were female. There was a near parity gender representation as male respondents were 49.6%. This showed that there was an almost equal enrolment of both gender in schools in Njiru sub-county, Nairobi County, Kenya.
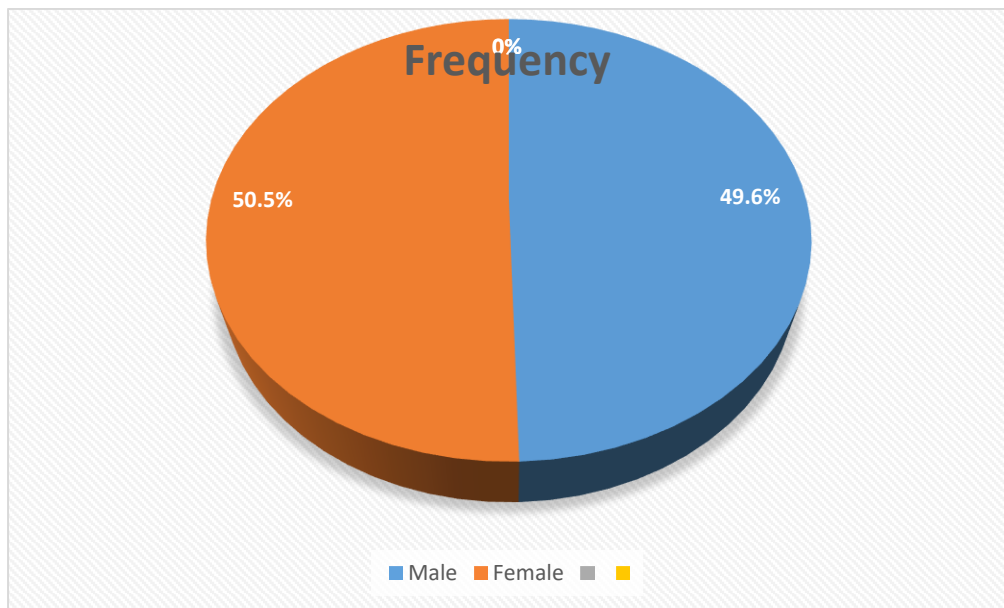
Figure 4.2 Students' gender distribution

Table 4: 2Age distribution of students

Age in years	Frequency (f)	(%)
Below 15	1	1
16 - 19	94	84.7
Above 20	16	14.4
Total	**111**	**100**

Majority of the students (84.7%) were aged between 16-19 years. This category was followed by respondents aged above 20 years at 14.4%, as shown in Table 4.2. The study showed that majority of the Form Four students were roughly around the ages expected for Form Four cohorts as the normal age for a form

four student is 17 years old. Having been in school longest, and their mature age, they were deemed to have adequate information as requested in the study.

Table 4: 3: Students performance in mathematics

		Frequency (%)
Rate mathematics performance	Poor	8.2
	Average	69.4
	Good	13.6
	Very good	6.4
	Excellent	2.8
Rate KCSE exam expectation in mathematics	Poor	1.9
	Average	19.9
	Good	36.1
	Very good	27.1
	Excellent	15.4

The respondents' mathematics performance had a majority rating it average at 69.4% with almost a quarter (22.8%) of the respondents indicated that they performed above average. The respondents who said that they performed below average were 8.2%.

When the interviewees were asked to rate KCSE exam expectations in mathematics, 19.9% indicated that they expect an average mark, 1.9% indicated that they expect below average result and 78.4% were expecting an above average mark in the KCSE exam results. This shows that the students were optimistic to perform better in mathematics KCSE exams compared to their current performance in mathematics as seen in Table 4.3.

4.4.2 Teachers demographic characteristics

Table 4: 4Teachers' Demographics

Demographics		Frequency (%)
Gender	Female	22(52)
	Male	20(48)
Professional qualification	Diploma	2 (4.8)
	B. ED	35 (83.4)
	M.ED	5 (11.9)
	Total	42 (100)
Teaching experience	Below 5	12 (28.6)
	5 – 10	14 (33.4)
	11 – 15	7 (16.7)
	16 – 20	2 (4.8)
	21 – 25	3 (7.2)
	Above 25	4 (9.6)
	Total	42 (100)

As seen in Table 4.4, the teacher's gender distribution had 22 (52%) female respondents, which was almost equal to the male respondents at 20 (48%). Majority of the respondents had Bachelor of education qualification at 83.4% followed by Master in education at 11.9% and lastly Diploma qualification at 4.8%. This shows that majority of the teachers met the threshold of the requirement of the Ministry of Education. According to the Ministry of Education someone qualified with either a Bachelor of Education Degree with two (2) teaching subjects or a Bachelor of Science or Arts Degree plus a Post Graduate Diploma in Education (PGDE) with two teaching subjects or a Bachelor of Science with Education / Bachelor of Arts with Education with two teaching subjects can be registered as a teacher. (www.tsc.go.ke)

Among the teacher respondents, a higher proportion at 33.4% had 5 - 10 years teaching experience, those with below 5 years' experience were at 28.6%,

11-15 years teaching experience were at 16.7% and above 15 years of experience had 21.4% respondents as shown in Table 4.4. This shows that majority of the teachers had more than 5 years of teaching experience hence they were likely to give satisfactory responses regarding objectives of the study.

4.5 Descriptive Statistics for Study Variables

The research instrument was divided into two sub-sections for each of the research variable. The two sub-sections consisted of closed and open-ended questions. To interpret the open-ended questions a five (5) point Likert scale was used. It is the scale that is used to facilitate the individuals to express their agreement or disagreement on a particular statement (Jamieson, 2004).

The 5 – point Likert scale comprised the scales; 1 = *strongly disagree* (SD), 2 = *disagree* (D), 3 = *neutral* (N), 4 = agree (A), and 5 = *strongly agree* (SA). If the scale was above 3(three) then respondents were in agreement with the statement(s) conversely when it was below 3(three) then they were in disagreement with the statement(s) and this is how the scale was interpreted in the study.

The open-ended questions provided an opportunity to the respondents to air their views and thereafter, the explanations were further subjected to qualitative analysis. Qualitative analysis involved several stages and conceptualization, coding and categorizing methods were used. This resulted in a fewer question being analyzed as some could not meet the threshold.

4.5.1 Instructional related factors influencing students' performance

Students were asked to indicate the level to which they agreed with the following factors: teaching methods, availability and utilization of teaching and learning resources and attitudes of teachers and students towards mathematics that influence performance of mathematics in KCSE examinations.

4.6 Teaching Methods and Students' Performance in Mathematics

Based on the reviewed literature, scholars define teaching method as a pattern of teaching modes designed to promote the achievement of a particular learning outcome. The choice of teaching method depends on the content, student's level of understanding, class demographic structure, teacher's philosophy of education, teacher's style of teaching and mission of the school.

Based on the literature review, according to Salman (2012) and Ozturk and Saritas(2009) teaching methods play a significant role on students' mathematics high achievements at secondary school level and hence this study sought to establish whether teaching methods used in teaching mathematics influence students' performance in secondary schools.

Table 4: 5 Type of Teaching Methods Used by the Teachers in Class

	Never	Rarely	Sometimes	Always	Mean	Std. Deviation
Lecture	18.1	17.2	37.9	27.1	2.74	1.05
Class Activities	1	3.7	47.8	47.8	3.42	0.61
Questions & Answers	0	1.9	23.5	74.8	3.73	0.49
Discussion	3.7	8.2	57.7	30.7	3.15	0.72
Class Experiments	10	29.8	39.7	20.8	2.71	0.91
Project Work	30.7	29.8	35.2	4.6	2.14	0.91
Demonstration	10.9	9.1	36.1	44.2	3.14	0.98
Group Technique	10.9	22.6	53.2	13.5	2.70	0.86

According to the data provided by the students, teachers generally use lecture method with 2.74±1.05. This method is not an appropriate teaching method while teaching mathematics as Wekesa (2013) postulates that the information learned through lecture method is easily forgotten.

A good number of respondents indicated that teachers use class activities teaching method at rate of 3.42±0.61 and demonstration as a teaching method at 3.14±0.98. This postulates that there was an active interaction between learners and teachers and this promotes high achievements mathematics objectives at secondary school level. The response rate regarding questions and answers teaching method was 3.73±0.49 and the rate of discussion teaching method was 3.15±0.72. This shows that teachers use both students' lower and

high order level thinking of students while teaching mathematics. This ascertains high achievements of mathematics objectives in secondary school level as Wekesa (2013) postulates that with these teaching methods students engage themselves fully to achieve the objectives however, according to statistics given by the Ministry of Education the students' mathematics performance in KCSE is very low.

According to data given by the students, teachers used class experiments as teaching method rate was 2.71±0.91, project work as a teaching method was 2.14±0.91 and group technique as a teaching method was 2.76±0.86. This shows that teachers generally did not use tangible resources while teaching mathematics and hence students were not engaged physically while learning mathematics. This hinders students' mathematics performance in KCSE level as Forester (2000) says that practical activities increase understanding of mathematics.

As seen in the Table 4.5, teachers generally used lecturing, questions and answers, discussion and demonstration teaching methods while teaching mathematics and this shows that there was an active interaction among teachers and students while teaching mathematics. On the other hand, it also indicates that teachers did not use student centered teaching methods such as class experiments, project work and use of group technique while teaching mathematics and this hinders effectiveness of learning the subject. This might be the reason for poor performance in mathematics in KCSE examinations in Njiru sub-county as it is denoted in the statistics of Ministry of Education.

Table 4: 6: Teaching Methods provided by Teachers

Opinion statements	SD (%)	D (%)	N (%)	A (%)	SA (%)	Mean	Std. Dev.
Mathematics teachers use lecture teaching method	40.5	31	9.6	9.6	9.6	2.17	1.324
Mathematics teachers use students centered teaching methods	2.4	2.4	23.9	50	21.5	3.86	.872

As seen in Table 4.6, according to data given by the teachers, majority of teachers did not use teacher centered methods however they used student centered teaching methods while teaching mathematics. As seen in the Table 4.6, majority of teachers said that they mainly used student centered teaching methods while teaching mathematics, however, according to the students they used teacher centered methods as seen in Table 4.5. This might be due to confusion between active interaction and fully engagement in class activities while teaching mathematics.

Table 4: 7 Teaching Methods provided by Students

	SD	D	N	A	SA	Total	Mean	Std. Dev.
Mathematics teachers use teacher centered method	17 (15.4)	14 (12.7)	23 (20.8)	41 (37)	16 (14.5)	111 (100)	3.23	1.28
Mathematics teachers select teaching method depending on content, student's level of understanding	10 (9.1)	4 (3.7)	9 (8.2)	47 (42.4)	41 (37)	111 (100)	3.95	1.19
Mathematics teachers identify the resources well in advance	3 (2.8)	5 (4.6)	27 (24.4)	48 (43.3)	28 (25.3)	111 (100)	3.84	0.949
Mathematics teachers use students centered teaching methods such as class experiments, projects, class activities	8 (7.3)	17 (15.4)	22 (19.9)	35 (31.6)	29 (26.2)	111 (100)	3.54	1.234

As it can be inferred from the table 4.7, according to the students, teachers were mastered in the selection of teaching methods depending on the content and the level of learners' understanding at a rate of 3.95±1.19. Moreover, they said that teachers were well mastered regarding identification of resources in advance at the rate of 3.84±0.949.

As seen in the Table 4.7, according to the students, teachers generally used teacher centered teaching methods at a rate of 3.23±1.28 though the deviation was quite high. On the other hand, majority of them said that teachers used student centered methods at the rate of 3.54±1.234. This may not result in

healthy conclusions regarding teaching method factor that influence students' mathematics performance.

4.7 Availability and Utilization of Teaching and Learning Resources Provided and Students' Performance in Mathematics

Based on literature review, studies done by Oyugi (2018), Mbugua, Kibet, Nkonke & Muthaa (2012) avaliability and utilization of teaching and learning resources influence students' mathematics performance in secondary level remarkebly. Lack of resources definitely hinders the achievement of objectives and therefore this study sought to establish whether avaliability and utilization of teaching and learning resources influence students' mathematics performance in secondary school level.

Table 4: 8 Availability and utilization of teaching and learning resources provided by students

	SD (%)	D (%)	N (%)	A (%)	SA (%)	Mean	Std. Dev.
The school has provided adequate mathematics teachers	2.8	4.6	4.6	39.7	48.7	4.27	.943
The school has provided and utilized adequate teaching learning resources such as textbooks, teaching aids, computers, internet, revision materials, time	1	6.4	13.6	36.1	43.3	4.14	.942
The school has provided adequate physical resources	3.7	10.9	27.1	42.4	16.3	3.57	1.006
The library has adequate reference and revision materials for mathematics	14.5	10.9	17.2	28.9	28.9	3.47	1.387
Mathematics teachers cover the syllabus in time and revise	11.8	19.9	21.7	27.1	19.9	3.23	1.300

From the study findings as seen in the Table 4.8, according to the students, schools had provided adequate number of teachers at the rate of 4.27±0.943. Availability of teachers influence students' mathematics performance greatly as Obwocha (2005) postulates that lack of resources, particularly teachers results in poor performance in national examinations.

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In addition, according to students, schools had provided and utilized adequate teaching learning resources such as textbooks, teaching aids, computers, internet connection, revision materials, and time at the rate of 4.14±0.942. Not surprisingly, they said that the provision of physical resources by the schools, rate was 3.57±1.006. They said that schools' libraries had adequate reference and revision materials for mathematics at rate of 3.47±1.387 and lastly, they mentioned that the mathematics teachers cover the syllabus in time.

Table 4: 9 Availability and utilization of teaching and learning resources provided by teachers

	SD	D	N	A	SA	Mean	Std. Dev.
School has provided adequate teachers of mathematics	4.8	28.6	26.2	33.4	7.2	3.1	1.05
School has provided adequate teaching, learning and physical resources and media	0	26.2	33.4	35.8	4.8	3.19	0.89
Library has adequate reference and revision materials for mathematics	4.8	16.7	35.8	31	12	3.29	1.04

As seen in the Table 4.9, teachers said that the schools had provided adequate teachers, and sufficient teaching, learning and physical resources, media and library with enough reference and adequate revision materials for mathematics.

Table 4: 10: Availability of physical resources provided by the researcher

Resources	Adequate	Inadequate	Not applicable	Total
Classrooms	4	8	0	12
Desks	4	8	0	12
Chalkboards/Smart Board	5	7	0	12
Textbooks	12	0	0	12
Exercise books	12	0	0	12
Teaching Aids	1	11	0	12
Revision Materials	12	0	0	12
Library	0	1	11	12
Lockers	7	5	0	12
Syllabus	12	0	0	12
Teacher& Learner Guide Book	12	0	0	12
Computers	3	8	1	12
Internet	3	8	1	12

As it can be inferred from the Table 4.8 and Table 4.9, according to the findings provided by the students and teachers the schools had provided adequate teaching and learning resources. However, as seen in Table 4.10, although few newly constructed schools had adequate teaching and learning resources majority of the schools did not have. Although 11 out of 12 schools did not have the libraries teachers and students noted that the schools had libraries with enough reference and revision materials for mathematics. Also, as seen in Table 4.5, majority of teachers did not use student centered teaching methods such as class projects and class experiment that demand availability of

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teaching and learning resources. These findings might hinder healthy conclusions regarding this factor influencing students' mathematics performance in secondary school level.

4.8 Attitude of Learner Towards Mathematics and their Performance

Based on the literature review, attitude can be refered as a positive or negative emotional tendency towards a stimuli and formation of attitude is experiental but not innate. Enu, Agyman and Nkumu (2015) note that students' positive attitude towards mathematics increases level of their efforts putting toward learning the subject. Mathematics is a subject that demand the use of high order level thinking skills and this can be achieved easily with positive attitude. Therefore, the study tried to find out whether attitudes of learners influence students' mathematics performance in secondary school level.

Table 4: 11 Attitude of learners towards mathematics provided by students

	SD (%)	D(%)	N (%)	A (%)	SA (%)	Mean	Std. Dev.
I view mathematics as a challenging and difficult subject	28.9	31.6	20.7	8.2	10.9	2.41	1.282
I feel discouraged and confused while studying mathematics	37.9	28	12.7	17.2	4.6	2.23	1.248
Students tend to have negative attitudes towards mathematics	7.3	7.3	20.7	31.6	33.4	3.77	1.201
Students tend to have positive attitudes towards mathematics	14.5	13.6	43.3	16.2	12.7	2.98	1.181

According to the study findings, majority of students said that the subject was not a challenging and a difficult subject, likewise they noted that they did not feel discouraged and confused while studying mathematics although the deviation was very high.

Additionally, according to the study findings, majority of the students had negative attitudes towards the subject but surprisingly a good number of students said that they had positive attitude towards mathematics as seen in the Table 4.11.

Table 4: 12 Attitude of learners towards mathematics provided by teachers

	SD (%)	D(%)	N (%)	A(%)	SA (%)	Mean	Std. Dev.
Students have positive attitudes towards mathematics	9.6	35.8	45.3	9.6	0	2.55	0.80
Students have negative attitudes towards mathematics	0	7.2	31	52.4	9.6	3.64	0.76
Students find mathematics as a challenging subject	0	7.2	7.2	59.6	26.2	4.05	0.79
Students are confused and discouraged while studying mathematics	4.8	19.1	31	38.1	7.2	3.24	1.01
Students are bored during mathematics lessons	9.6	33.4	23.9	31	2.4	2.83	1.06
Students enjoy mathematics	2.4	21.5	50	21.5	4.8	3.05	0.85
Students have difficulties in integration of structures of mathematics topics	2.4	2.4	16.7	54.8	23.9	3.95	0.85

From the study findings, according to the teachers, majority of students had negative attitudes towards mathematics likewise majority of teachers noted that students did not have positive attitudes towards mathematics.

In general, majority of the teachers reported that students viewed the subject as a challenging subject, students were confused and discouraged while studying mathematics, students were bored during mathematics lessons and students had difficulties in integration of structures of mathematics topics. Surprisingly, teachers said that students enjoyed mathematics as seen in the Table 4.12.

As seen in Table 4.11 and Table 4.12 teachers and students were in disagreement regarding attitudes of learners towards mathematics. For example, teachers said that students viewed mathematics as a challenging and a difficult subject but the learners themselves didn't view the subject as a challenging and a difficult subject. Surprisingly, both teachers and students said that the learners have negative attitudes towards the subject. According to data given by the Ministry of Education the students' mathematics performance is very low and this might be the reason for the low performance.

4.9 Attitudes of teachers towards mathematics and students' performance in Mathematics

Salman (2012) postulates that students' mathematics performance depends on teachers' effectiveness comprehensively. Odiri (2010) says that teachers' positive attitudes promote students' mathematics performance while their negative attitude hinders effectiveness of the teaching and learning progress of the subject. Due to the nature of the subject teachers play key role in teaching

and learning process of the subject. Therefore, the study sought to establish whether attitudes of teachers influence students' mathematics performance in secondary school level.

Table 4: 13 Attitudes of teachers towards mathematics provided by students

	SD (%)	D (%)	N (%)	A (%)	SA (%)	Mean	Std. Dev.
Mathematics teachers have positive attitude toward math	1.9	1	3 (2.8)	20 (18.1)	85 (76.6)	4.7	0.848
Mathematics teachers have negative attitude toward math	73	17.2	7.3	1.9	1	1.41	0.779

From the study findings, majority of the students reported that teachers had positive attitudes towards mathematics and likewise they noted that teachers did not have negative attitudes towards mathematics as seen in the Table 4.13.

Table 4: 14 Attitudes of teachers toward mathematics provided by teachers

	SD (%)	D (%)	N (%)	A (%)	SA (%)	Mean	Std. Dev.
Teachers have positive attitudes towards mathematics	4.8	2.4	7.2	50	35.8	4.1	0.98
Teachers have negative attitudes towards mathematics	50	40.5	7.2	2.4	0	1.62	0.73

Similar to data provided by the students, teachers as respondents said that they had positive attitudes towards mathematics subject and naturally majority of them reported that they did not have negative attitudes towards the subject as seen in the Table 4.14.

In short, according to data given by both students and teachers, the teachers had positive attitudes towards mathematics though students' mathematics performance is very low according to the statistics given by the Ministry of Education and this might not lead healthy conclusions regarding influence of attitudes of teachers on students' mathematics performance in secondary school level.

4.10 Thematic analysis

4.10.1 Thematic analysis of challenges teachers undergo in teaching methods

Teachers were asked to determine the major challenges regarding independent variables of the study such as teaching methods, attitudes of students and attitudes of teachers towards mathematics subject and availability and utilization of teaching and learning resources.

Table 4: 15 Major challenges regarding teaching methods as provided by teachers

Challenges	Frequency	%
Absenteeism and new students transfer	1	2.4
Effective communication from students	1	2.4
Inadequate teaching and learning resources and difficulty in applying different approach during lessons	8	19.0
Lack of confidence and inability to comprehend mathematics	5	11.9
Large number of students hinders personalized attention and learner centered methods impossible	8	19.0
Learner centered methods take a lot of time and this hinders syllabus coverage	13	31.0
Negative attitudes	3	7.1
No challenge	4	9.5
Some topics are abstract and students can't comprehend	4	9.5
Students are reluctant to participate while teaching math lessons	6	14.3
Some teaching methods are not student friendly	1	2.4
Some students are lazy and they sleep during the lessons	5	11.9
Teaching mathematics does not have a variety of teaching methods to arouse learners' attention	1	2.4
Lecturing methods are easy to apply and some topics have rigid teaching methods	5	11.9
Balancing diverse learning needs	1	2.4

N = 42

From the study findings, teachers indicated that there were various challenges. The major ones were inadequacy of teaching and learning resources and difficulty in applying different teaching methods during lessons, lack of

confidence and inability to comprehend mathematics, large number of students that hinders personalized attention and that makes application of learner centered methods impossible, learner centered methods that take a lot of time and hinder syllabus coverage, reluctance of students during participation of math lessons, students' laziness and their sleep during mathematics lessons and teachers' preference to use teacher centered methods as they are easy to be applied as shown in Table 4.15.

Moreover, there were other challenges during application of teaching methods in class such as effective communication from students, students' negative attitudes, some topics were abstract and could not be comprehended, some teaching methods were not learner friendly, teaching mathematics did not have variety of methods that arouse students' attention, and difficulty in balancing students' diverse needs.

In short, the main challenges were lack of time to cover the syllabus and hence teachers tended to use teacher centered teaching methods, lack of resources to apply various teaching methods while teaching mathematics and large number of students that hinders to apply student centered teaching methods. Naturally, teachers generally used teacher centered methods while teaching mathematics and this results in poor performance as Wekesa(2013) says that teacher centered methods leads to rote learning.

4.10.2 Thematic analysis regarding teaching and learning resources

Table 4: 16 Challenges regarding availability and utilization of teaching and learning resources as provided by teachers

Challenges	Frequency	%
High work load of the subject	1	2.4
Lack of teaching and learning resources	32	76.1
Lack of revision materials	1	2.4
Inability to understand math language	1	2.4
High number of students	2	4.8
Lack of technology	2	4.8
No challenge regarding availability of teaching and learning resources	3	7.1
Students never figure out the learning resources are available	1	2.4
Lack of number of teachers	3	7.1
While using audios/videos, learners tend to concentrate on the graphics rather than the concepts	1	2.4

As seen in the Table 4.16, the major challenges reported by the teachers were lack of teaching and learning resources, high number of students, lack of teachers and lack of technology. This elicits poor performance as studies done by Mbugua, Kibet, Nkonke & Muthaa (2012), Obwocha (2005), Schiefelbein and Farnell (1973) as cited by Rosenthal (2007) and Kalunda and Otanga (2015) have shown that avaliabilty of teaching and learning resources affects achievement of students' mathematics perfomance.

4.10.3 Thematic analysis regarding attitudes of learners towards the subject

Table 4: 17 Challenges regarding students' attitudes while teaching in class provided by teachers

Challenges	Frequency	%
Negative attitudes	21	50
Lack of confidence	1	2.4
Learners are reluctant to learn the subject	1	2.4
Negative attitudes due to peer influence	8	19.1
Poor participation	6	14.3
Lack of concentration	2	4.8
Lack of interest towards the subject	6	14.3
Learners view the subject as a difficult and challenging subject	8	19.1
Not completing the work	3	7.1
Poor background	2	4.8
Lack of courage	1	2.4

As it can be inferred from the Table 4.17, according to the teachers, students' negative attitudes towards the subject, negative perception towards the subject due to peer pressure and viewing the subject as a challenging and a difficult subject were the main challenges regarding attitudes of learners and teachers towards the subject. This leads to poor performance as studies done by Mensah, Okyero and Kuranchie (2013), Enu, Agyman and Nkumu (2015), Nandwa, Wasike and Wanjala (2015), Odiri (2011) and Mutai (2010) have shown that positive attitudes of learners and teachers towards mathematics bring high achievements of the subject and conversely their negative attitudes result in poor performance.

4.11 Results of the school principals' interview on how to improve students' mathematics performance in KCSE

The school principals were interviewed on how to improve students' mathematics performance in KCSE regarding; teaching methods used by the teachers, attitudes of teachers and students towards mathematics, availability of teaching and learning resources, and other factors influencing students' mathematics performance.

Regarding teaching methods used by the teachers in schools, it was established that teachers need to use learner centered teaching methods during the lessons, use models that mimic real life situation to make mathematics interesting and build learners' confidence. Teachers should integrate ICT in teaching and learning to improve performance, lay good foundation in Form 1 and 2, motivate students based on their efforts and achievements and complete the syllabus in time through more efforts. Teachers should find authentic ways of teaching mathematics to make the subject delivery more interesting and embrace SMASSE knowledge.

Regarding strategies required to be put in place to improve teaching methods used by mathematics teachers, the study found out that teachers should apply SMASSE teaching and learning methods, embrace hands on activities and class experiments. They should integrate ICT into the curriculum to provoke leaners' interest, use learner centered teaching methods, embrace group discussions, use frequent formative assessments, attend to symposiums and seminars, encourage team teaching and make topical revisions.

The above statements are in line with the findings of the study done by Cockcraft committee (2014). The committee say that learner centered teaching methods require explanation by the teacher, discussion between teacher and students and students among themselves, suitable practical class activities, integration and practice of basic skills, problem solving, application of mathematics to real life situations and exploration work.

Based on attitudes of teachers and students, it was found out that teachers should change students' attitudes and mentality towards mathematics by encouraging and motivating them through being close to them. Teachers should communicate and reason the students that mathematics is an easy subject like any other. What is more, teachers should form student peer teaching groups so that they assist one another when necessary and encourage learners to practice frequently through formative assessments.

What is more, the study established that to facilitate learners to have positive attitudes towards mathematics teachers should motivate and reward the learners based on their efforts and achievements. They should reason the learners that the subject is not hard but challenging and it is a must subject required in all carriers, encourage peer teaching and teach learners from known to unknown concepts.

From the study findings it can be inferred that when students are encouraged and have positive attitudes towards the subject, they put more efforts as postulated by Enu, Agyman and Nkumu (2015). They say that students' positive attitude towards mathematics increases level of their efforts putting toward learning the subject.

Concerning availability and utilization of teaching and learning resources from the study findings, teaching and learning resources should be available and accessible to both teachers and learners and when they are not available teachers should improvise and utilize what is available. Technology should be integrated into the curriculum and should be utilized well. The available resources particularly the local ones should be utilized correctly and collaboration among the teachers, parents and students should be laid out firmly. From the study findings, to achieve mathematics objectives teaching and learning resources should be available and accessible to both teachers and students as postulated by Oyugi (2018).

Lastly, principals were asked to point out the other factors influencing students' mathematics performance in secondary school level and the study found out that peer influence affect students' attitudes towards mathematics negatively, parent involvement, viewing the subject as abstract, the amount of practicing and high number of students in a class. These factors should be examined in future studies.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter provides a summary of the major findings of the study and also sets to draw conclusions and make recommendations and suggestions for further researches.

5.2 Summary of the Study

The purpose of this study was to examine the influence of instructional related factors influencing students' performance of the mathematics in KCSE examinations in public schools in Njiru Sub-county, Kenya.

The objective of the study was to investigate the instructional related factors influencing performance of the mathematics in KCSE examinations in public schools in Njiru Sub-county, Kenya. The study was guided by the following specific objectives; to establish the influence of teaching methods on performance of the students in mathematics in KCSE examinations; to determine the influence of availability of the teaching and learning resources on performance of the students in mathematics in KCSE examinations; to determine the influence of utilization of the teaching and learning resources on performance of the students in mathematics in KCSE examinations; to establish the influence of attitude of the learners towards mathematics on performance of the students in mathematics in KCSE examinations; and to establish the influence of attitude of the teachers towards mathematics on performance of the students in mathematics in KCSE examinations.

The literature on instructional related factors influencing students' mathematics performance in KCSE examinations in Njiru sub-county was reviewed. The independant and dependant variables were discussed based on Bruner instructional learning theory.

The researcher used ex post facto design to collect data from key stakeholders (principals, mathematics teachers and form four students from public secondary schools in Njiru sub-county, Kenya.)

Questionnaires and interviews were administrated to 12 principals, 42 mathematics teachers and 111 form four students from public secondary schools in Njiru sub-county, Kenya. Also, an observation checklist regarding availability of physical resources was used to collect the data.

The quantitative data was coded and analyzed using descriptive statistics and qualitative data was analyzed using conceptual content analysis.

5.2.1 Influence of teaching methods on performance of students in mathematics in KCSE examinations

According to the students' responses, it was established that majority of the teachers used teacher centered teaching methods though there was an active interaction between students and teachers during mathematics lessons. According to students' responses, the study revealed that teachers generally used lecturing, questions and answers, discussion and demonstration teaching methods while teaching mathematics and this indicates that there was an active interaction among the teachers and the students. Moreover, according to teachers' responses teachers also used teacher centered teaching methods due to several reasons. They said that we tend to use teacher centered teaching

methods due to lack of teaching and learning resources and lack of time to cover the syllabus as student centered teaching methods take more time to cover the syllabus. Also, the study established that teachers hardly used learner centered teaching methods such as class experiments, group technique and project works. As mentioned in chapter one, according to Ministry of Education statistics the results of students' mathematics performance in KCSE in Njiru sub-county in public secondary schools is very low and based on literature review teacher centered methods result in rote learning and therefore cause poor performance. Therefore, based on the study findings it can be inferred that teacher centered methods cause poor performance in mathematics in secondary school level.

5.2.2 Influence of availability of the teaching and learning on performance of the students in mathematics in KCSE examinations

According to all respondents of the study it was found that majority of the schools did not have enough teaching and learning resources to teach mathematics effectively. According to them lack of teaching and learning resources hinders application of student-centered methods and hence students were not able to engage themselves into the classroom activities during mathematics lessons. Majority of the schools did not have library, internet connection and computers, and they did not have enough desks, classrooms, teaching aids and smart and chalk boards. However, it was observed that majority of schools had enough textbooks and exercise books because these stationeries were provided by the government at the beginning of every year. In addition, it was noted that all schools had adequate teacher and learner guide books, and syllabus and revision materials as they were provided to all learners

by the sub-county education director office. On the other hand, it was observed that the classes were congested and the number of mathematics teachers were not adequate. Based on the literature review this factor might be the factor leads to the poor performance.

5.2.3 Influence of utilization of the teaching and learning on performance of the students in mathematics in KCSE examinations

From the study it was noted that very few newly constructed schools had provided adequate physical resources and majority of the schools did not provide adequate physical facilities. Also, the study established that 11 out 12 schools did have library and majority of the schools did not cover the mathematics syllabus in time to allow time for students to revise on their own. Additionally, the study found out that schools did not have internet connection and computers to enhance digital learning and this hinders learners from clear concept visualization. Also, schools were understaffed and hence teachers were overwhelmed due to high work load. The classes were congested and hence individual attention during mathematics classes was not possible. Based on literature review, utilization of teaching and learning resources according to the students' level of understanding, pace and individual interests plays a key role in achievement of mathematics objectives in KCSE examinations. From the study findings it can be inferred that teaching and learning resources were not utilized properly due to inadequacy of materials and technology, class congestion and overwhelming work load of teachers. This factor can be the reason causing poor performance in KCSE examinations.

5.2.4 Influence of attitudes of learners towards mathematics on performance of the students in mathematics in KCSE examinations

From the study findings, it was noted that majority of the students did not have positive attitude towards mathematics and only some had positive attitudes. Equally, the study found out that majority of the students had negative attitudes towards mathematics subject. Also, the study noted that majority of the students viewed mathematics as a difficult and a challenging subject. Additionally, the study established that majority of the students were confused, bored and discouraged while studying mathematics. Likewise, the study noted that majority of the students did not enjoy mathematics.

Additional results indicated that some challenges regarding the students' attitudes were negative attitudes towards mathematics, viewing mathematics as a difficult and a challenging subject, students' poor background from primary school, students' unwillingness to participate in the classes and to complete the homework, negative influence from the peers, and lack of interest towards the subject.

Based on literature review negative attitudes towards the subjects hinders achievement of mathematics objectives. Therefore, from the study findings it can be inferred that students' negative attitudes influences students' mathematics performance in KCSE negatively.

5.2.5 Influence of attitudes of teachers towards mathematics on performance of the students in mathematics in KCSE examinations

From the study findings, according to the students and teachers, teachers had positive attitudes towards mathematics. As mentioned by the scholars in chapter two, teachers' positive attitudes towards mathematics promotes achievement of mathematics objectives highly. However, according to the statistics provided by the Ministry of the Education the students' mathematics performance in KCSE examinations in public secondary schools in Njiru sub-county is very low. Therefore, from this study findings the influence of this factor on students' mathematics performance was not concluded.

5.3 Conclusions

Based on teaching methods objective, the study concluded that majority of the teachers used teacher centered methods due to lack of time to cover the syllabus in time and inadequacy of teaching and learning resources. Additionally, the study concluded that although there were active interactions among the teachers and students, teachers did not use learner centered teaching methods that necessitate fully engagement of students into the class activities. Naturally, this hinders the effective teaching and learning process. Similarly, the study concluded that there were some other challenges that teachers experienced while using various teaching methods in class. They were lack of confidence and inability to comprehend mathematics concepts, large number of students, students' unwillingness to participate in mathematics classes, and difficulty in balancing diverse learning needs of the learners.

Regarding the availability of teaching and learning resources, the study concluded that teaching and learning resources were not adequate. Majority of the schools did not have library, internet connection and computers. The schools did not have enough desks, classrooms, teaching aids and smart and chalk boards. However, it was observed that majority of schools had enough textbooks and exercise books because these stationeries were provided by the government at the beginning of every year. In addition, it was noted that all schools had adequate teacher and learner guide books, and syllabus and revision materials as they were provided to all learners by the sub-county education director office. On the other hand, it was observed that the classes were congested and the number of mathematics teachers were not adequate.

Concerning utilization of teaching and learning resources, it was concluded that very few newly constructed schools had provided adequate physical resources and a very high number of schools did not provide adequate physical facilities. Also, the study established that 11 out of 12 schools did not have library and majority of the schools did not cover the mathematics syllabus in time to allow time for students to revise on their own.

Additionally, the study found out that schools did not have internet connection and computers to enhance digital learning and this hinders learners from clear concept visualization. Also, schools were understaffed and hence teachers were overwhelmed due to high work load. The classes were congested and hence individual attention during mathematics classes was not possible.

Regarding attitudes of the learners towards mathematics, the study concluded that majority of the students did not have positive attitude towards mathematics and only some had positive attitudes. Also, the study noted that majority of the students viewed mathematics as a difficult and a challenging subject. Additionally, the study established that majority of the students were confused, bored and discouraged while studying mathematics. Likewise, the study noted that majority of the students did not enjoy mathematics. Additional results indicated that some challenges regarding the students' attitudes were negative attitudes towards mathematics, viewing mathematics as a difficult and a challenging subject, students' poor background from primary school, students' unwillingness to participate in the classes and to complete the homework and negative influence from the peers, and lack of interest towards the subject.

Regarding attitudes of the teachers towards mathematics, it was concluded that teachers had positive attitudes towards mathematics

5.4 Recommendations

Based on the study findings, the study makes the following recommendations;

Based on teaching methods objective, the study found out that majority of the teachers used teacher centered teaching methods due to shortage of time to cover the syllabus and inadequacy of teaching and learnings resources although there was an active interaction among students and teachers during mathematics lessons. Therefore, the study recommends that teachers should use learner centered methods while teaching mathematics through improvising and utilizing available teaching and learning resources, and put extra efforts to cover

the syllabus. Similarly, it was established that there were some other challenges that teachers experienced while teaching mathematics, thus the study recommends that teachers need to use learner friendly teaching methods, use models that mimic real life situation to make mathematics interesting, build confidence in learners, integrate technology into the curriculum of mathematics that enhance visual conceptualization, lay out good foundation in form 1 and 2, motivate students according to their efforts and academic achievements, and embrace SMASSE knowledge.

Regarding availability and utilization of teaching and learning resources, the schools should provide library, internet connection and computers, and provide adequate physical resources such as desks, classrooms, teaching aids and smart and chalk boards. Additionally, the schools should decongest the classes and provide adequate number of mathematics teachers and embrace partnership among parents/guardians, students and teachers. Also, the study recommends that principals should encourage teachers to source from local materials, support teachers by making available the resources they require, organize workshops and trainings e.g. SMASSE for teachers and reward teachers and learners who excel.

Based on attitudes of teachers and students, the study recommends that teachers should change students' attitudes towards mathematics. Teachers should find ways of teaching mathematics to make subject delivery more interesting, form peer teaching groups and motivate and reward the learners based on their efforts and academic achievements.

5.5 Suggestions for further research

The study was conducted only in 12 public secondary schools in Njiru Sub-county and hence future studies should be done in all schools in Nairobi City County. Also, there are other factors influencing students' mathematics performance in KCSE examinations in Njiru sub-county and these ones should be examined. Some of the were mentioned by the principals and they were peer influence that affects students' attitudes towards mathematics negatively, parent involvement, viewing the subject as abstract, the amount of practicing and drilling and high number of students in a class.

Since the study adopted ex post facto design, it does not capture the dynamic nature of factors that determine the relationships between independent and dependent variables. In other words, even if relationships are significant, other factors not included in the current study may also play an important role. Thus, future study should be conducted with a different research design such as longitudinal.

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APPENDICES

APPENDIX I: LETTER OF INTRODUCTION

<div align="right">

Kileleshwa

Heights B18,

Kileleshwa

Nairobi, Kenya

</div>

Dear Sir/Madam

RE: To the Principal…………………………………….Secondary School

I kindly request permission to conduct research in public secondary schools in Njiru Sub-county in Nairobi City County with your jurisdiction. I am a student at the University of Nairobi doing Master of Education in Curriculum Studies. My study is instructional related factors affecting students' performance in K.C.S.E in public secondary schools in Nairobi City County, Kenya.

The information obtained from schools and Ministry of Education will be used only and exclusively for academic purpose.

Thanking in advance. I look forward for your maximum cooperation.

Yours faithfully,

Ismail Kucuk

E55/81739/2015

APPENDIX II: QUESTIONNAIRE FOR STUDENTS

A study is carried out to establish Instructional Related Factors Influencing Students' Performance of Mathematics in K.C.S.E in Public Secondary Schools in Njiru Sub-County. You have been chosen as a respondent and please fill in the questionnaire as accurately as you can. This is solely an academic exercise and the information you give will highly be confidential.

PART A: Background information

1. What is your gender?   Male (……)   Female (…….)
2. What is your age?   Below 15 (……)   16-19(……)   Above 20(…….)

PART B: Students' Mathematics Performance in KCSE level

3. How do you rate your mathematics performance since you joined form one?

Poor (……)   Average(…..)   Good(……)   Very good(…….) Excellence(……)

4. How do you rate your expectation in mathematics in KCSE exam?

Poor (……)   Average(…..)   Good(……)   Very good(…….) Excellence(……)

PART C: The Type of Teaching Methods Used by the Teachers in Class

5. Please tick the type in which teachers are using the following teaching methods in class.

Teaching Method	Always	Sometimes	Rarely	Never
Lecture				
Class Activities				
Questions&Answers				
Discussion				
Class Experiments				
Project Work				
Demonstration				
Group Technique				

PART D: Instructional Related Factors Influencing Students' Performance

Please indicate the level to which the following factors: teaching methods, availability and utilization of teaching and learning resources and attitudes of teachers and students towards mathematics that influence performance of the mathematics in KCSE examinations. Please record your answer by ticking in

the spaces provided, (Strongly Disagree=SD, Disagree=D, Neutral=N, Agree=A, Strongly Agree=SA)

6. **Teaching Methods**

Statements	SD	D	N	A	SA
Mathematics teachers use teacher centered method					
Mathematics teachers select teaching method depending on content, student's level of understanding,					
Mathematics teachers identify the resources well in advance					
Mathematics teachers use students centered teaching methods such as class experiments, projects, class activities, etc.					

7. **Availability and utilization of teaching and learning resources**

Statements	SD	D	N	A	SA
The school has provided adequate teachers of mathematics					
The school has provided and utilized adequate teaching learning resources such as textbooks, teaching aids, computers, internet, revision materials, time, etc					
The school has provided adequate physical resources					
The library has adequate reference and revision materials for mathematics					
Mathematics teachers cover the syllabus in time and revise					

8. **Attitude of learner towards mathematics**

Statements	SD	D	N	A	SA
I view mathematics as a challenging and difficult subject					
I feel discouraged and confused while studying mathematics					
Students tend to have negative attitudes towards mathematics					
Students tend to have positive attitudes towards mathematics					

9. **Attitudes of teachers towards mathematics**

Statements	SD	D	N	A	SA
Mathematics teachers have positive attitude toward math					
Mathematics teachers have negative attitude toward math					

APPENDIX III: QUESTIONNAIRE FOR TEACHERS

A study is carried out to establish Instructional Related Factors Influencing Students' Performance of Mathematics in K.C.S.E in Public Secondary Schools in Njiru Sub-County. Please fill in the questionnaire as accurately as you can. This is solely an academic exercise and the information you give will highly be confidential.

PART A: Background information

1. What is your gender?   Male (……) Female (…….)

2. Indicate your professional qualification

Diploma (..…..)   PGDE (…….)   B.ED (……)   M.ED (…......)   PhD (……)

3. What is your teaching experience?   Below 5 years (…….)   5-10(……..)

11-15(……)   16-20(……..)   21-25(…….)   Above 25 years (……..)

PART B: Instructional Related Factors Influencing Students' Performance

Please indicate the level to which of the following factors: teaching methods, availability and utilization of teaching and learning resources and attitudes of teachers and students towards mathematics that influence performance of the mathematics in KCSE examinations. Please record your answer by ticking in the spaces provided, (Strongly Disagree=SD, D=Disagree, N=Neutral, A=Agree, SA=Strongly Agree)

4. **Teaching Methods**

Statements	SD	D	N	A	SA
Mathematics teachers use lecture teaching method					
Mathematics teachers use students centered teaching methods					

5. **Availability and utilization of teaching and learning resources**

Statements	SD	D	N	A	SA
The school has provided adequate teachers of mathematics					
The school has provided adequate teaching, learning and physical resources and media					
The library has adequate reference and revision materials for mathematics					

6. **Attitude of teachers towards mathematics**

Statements	SD	D	N	A	SA
Teachers have positive attitudes towards mathematics					
Teachers have negative attitudes towards mathematics					

6. **Attitude of learner towards mathematics**

Statements	SD	D	N	A	SA
Students have positive attitudes towards mathematics					
Students have negative attitudes towards mathematics					
Students find mathematics as a challenging subject					
Students are confused and discouraged while studying mathematics					
Students are bored during mathematics lessons					
Students enjoy mathematics					
Students have difficulties in integration of structures of mathematics topics					

8. While teaching in class, what are major challenges do you have regarding teaching methods?

9. While teaching in class, what are major challenges do you have regarding teaching and learning resources?

10. While teaching in class, what are major challenges do you have regarding students' attitudes?

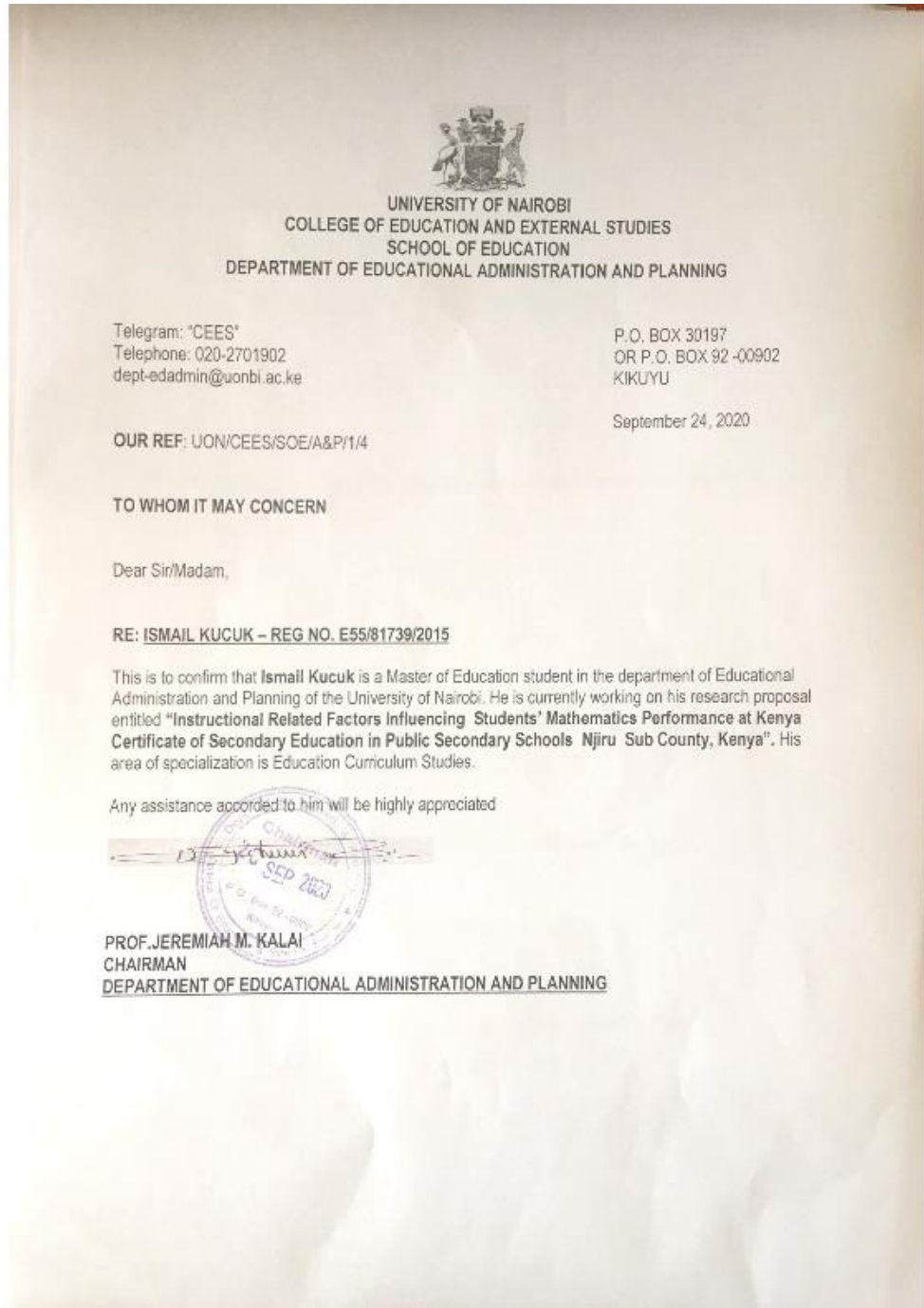**APPENIX IV: INTERVIEW SCHEDULE FOR PRINCIPALS**

1. In order to improve students' mathematics performance in KCSE what are your suggestions regarding teaching methods used by mathematics teachers?

2. In order to improve students' mathematics performance in KCSE what are your suggestions regarding attitudes of teachers and attitudes of learners towards mathematics?

3. In order to improve students' mathematics performance in KCSE what are your suggestions regarding availability and utilization of teaching and learning resources?

4. In order to improve students' mathematics performance in KCSE what are your strategies regarding teaching methods used by mathematics teachers?

5. In order to improve students' mathematics performance in KCSE what are your strategies regarding attitudes of teachers and attitudes of learners towards mathematics?

6. In order to improve students' mathematics performance in KCSE what are your strategies regarding availability and utilization of teaching and learning resources?

7. In your opinion, what are the other factors that influence students' performance in mathematics in KCSE and what can be done to improve students' mathematics performance accordingly?

APPENDIX V: OBSERVATION CHECKLIST

Availability and Adequacy of Teaching, Learning and Physical Resources

Resources	Availability	Adequate	Inadequate
Classrooms			
Desks			
Chalkboards/Smart Board			
Textbooks			
Exercise books			
Teaching Aids			
Revision Materials			
Library			
Lockers			
Syllabus			
Teacher& Learner Guide Book			
Computers			
Internet			

APPENIX VI: AUTHORIZATION LETTER

UNIVERSITY OF NAIROBI
COLLEGE OF EDUCATION AND EXTERNAL STUDIES
SCHOOL OF EDUCATION
DEPARTMENT OF EDUCATIONAL ADMINISTRATION AND PLANNING

Telegram: "CEES"
Telephone: 020-2701902
dept-edadmin@uonbi.ac.ke

P.O. BOX 30197
OR P.O. BOX 92 -00902
KIKUYU

September 24, 2020

OUR REF: UON/CEES/SOE/A&P/1/4

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

RE: ISMAIL KUCUK – REG NO. E55/81739/2015

This is to confirm that **Ismail Kucuk** is a Master of Education student in the department of Educational Administration and Planning of the University of Nairobi. He is currently working on his research proposal entitled **"Instructional Related Factors Influencing Students' Mathematics Performance at Kenya Certificate of Secondary Education in Public Secondary Schools Njiru Sub County, Kenya".** His area of specialization is Education Curriculum Studies.

Any assistance accorded to him will be highly appreciated

PROF.JEREMIAH M. KALAI
CHAIRMAN
DEPARTMENT OF EDUCATIONAL ADMINISTRATION AND PLANNING

APPENDIX VII: RESEARCH PERMIT

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION

Ref No: 922951   Date of Issue: 09/October/2020

RESEARCH LICENSE

This is to Certify that Mr.. Ismail Kucuk of University of Nairobi, has been licensed to conduct research in Nairobi on the topic: INSTRUCTIONAL RELATED FACTORS INFLUENCING STUDENTS' MATHEMATICS PERFORMANCE AT KENYA CERTIFICATE OF SECONDARY EDUCATION IN PUBLIC SECONDARY SCHOOLS, NJIRU SUB-COUNTY, KENYA for the period ending : 09/October/2021.

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Director General
NATIONAL COMMISSION FOR
SCIENCE, TECHNOLOGY &
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