

**EFFECT OF SCHOOL BASED FACTORS ON LEARNERS' ACADEMIC
ACHIEVEMENT IN MATHEMATICS IN PUBLIC MIXED DAY SECONDARY
SCHOOLS IN MARIGAT SUB-COUNTY, KENYA**

BY

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DEDICATION

This thesis is dedicated to my wife, children, friends, and lecturers of Bomet University College for their support, love and encouragement in writing this thesis.

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I thank God Almighty and glorify Him for gift of life and good health. I thank Bomet University college for giving me chance and support to further my studies. I am grateful to Dr Polycarp Muchesia Ishenyi and Dr. Daniel K Chesaro for their guidance in writing this thesis. I also thank my family members and friends for their encouragement.

ABSTRACT

Mathematics forms foundation of both scientific and technological knowledge. It determines learners career options in tertiary education and beyond. Kenya National Examination Council reveals that national learners' achievement in Kenya Certificate of Secondary Education Mathematics examination since 2019 to 2023 has been a mean grade of D and below. Similarly, in Marigat Sub County, Mathematics mean grade between 2019 and 2023 was D minus. Learners in Marigat Sub-County are achieving a low mean grade. This study, therefore, sought to investigate the effect of school-based factors on learners' academic achievement in mathematics in public mixed day secondary schools in Marigat Sub-County, Kenya. The specific objectives of the study were to: establish the effect of learning environment factors, the curriculum implementation factors, the teacher related factors, and learner related factors on academic achievement in mathematics in public mixed day secondary schools in Marigat Sub County. The study utilized the Gagne's Theory (1985) which holds that event in the surrounding influence the process of learning. The study adopted a mixed methods research design. The target population was 616 subjects comprising 18 principals, 44 mathematics teachers and 554 form four learners from 18 public mixed day secondary schools in Marigat Sub County. The study utilized purposive and simple random sampling techniques in selecting the sample for the study. Twelve (12) schools were purposively selected from the target population of 18 public mixed day secondary schools. All the 12 principals of the schools were included in the study while simple random sampling was used to select 24 mathematics teachers and 120 learners which made a sample of 156 respondents. Data was collected by a questionnaire, an interview schedule, and document analysis. Reliability of research instruments was ensured by using internal consistency which yielded a Cronbach's alpha of 0.861 and test re-test methods where the questionnaire for teachers had a reliability coefficient of 0.791 while the questionnaire for students had a reliability coefficient of 0.812 which surpassed the commonly accepted threshold of 0.70. Validity was tested using content, construct and face validity. Content validity index yielded an index of 0.861 against the set threshold of 0.8. Analysis of data was done using both descriptive and inferential statistics with the help of the statistical package for social science (SPSS). For descriptive statistics, frequency and percentages were used while Pearson's correlation and regression analysis were used for inferential statistics. The regression analysis revealed that learning environment factors ($r= 0.054$, $p= 0.560$) and ($\beta= .056$, $p>0.05$) do not have a significant effect on mathematics achievement in public mixed day secondary schools in Marigat Sub-County. However, curriculum implementation factors ($r= 0.551$, $p<.05$) ($\beta= .530$, $p<0.05$), teacher-related factors ($r= 0.308$, $p=.001$), ($\beta= .158$, $p<.05$) and learner-related factors ($r=0.466$, $p<.05$), ($\beta= .243$, $p<.05$) have a significant and positive effect on mathematics achievement. Based on the findings from regression analysis, the study recommends investment in teaching infrastructure and resources, improvement of teacher staffing level, establishment of remedial classes for struggling learners, encouraging active learning strategies that are learners centred and exposing learners to successful role models.

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ABBREVIATIONS

CEMASTEA	:	Centre for mathematics, science, and technology education in Africa
EU	:	European Commission
FSE	:	Free Secondary Education.
GOK	:	Government of Kenya.
HOD	:	Head of Department.
KCSE	:	Kenya certificate of secondary education
KIE	:	Kenya institute of education.
KNEC	:	Kenya National Examination Council
MOE	:	Ministry of Education.
NCTM	:	National council of teachers of mathematics.
NGO	:	Non-Government Organization.
OECD	:	The Organization for Economic Cooperation and Development
PISA	:	Programme for International Student Assessment
PPS	:	points per student
SMASSE	:	Strengthening mathematics and science in secondary education.
SPSS	:	Statistical Package for Social Science.
TIMS	:	Third international mathematics and science

CHAPTER ONE

INTRODUCTION

1.0 Overview

This chapter presents with the background of the study which is a brief explanation of mathematics as a subject. It also highlights the statement of the problem, purpose of the study, conceptual framework, theoretical framework, and objectives of the study. Further it enumerates the research questions, significance of the study, limitations of the study and assumption of the study.

1.1 Background to the Study

Mathematics is a field study that focuses on logical and abstract properties of numbers, shapes, quantities, and patterns (Thanheiser, 2023). Mathematics is a subject that affects all features of the human life at diverse levels. Fung and Poon (2021) stated that mathematics improves reasoning to develop and assist in analytical thinking which supports the mind to accelerate and enable learners to be realistic and to perform everyday activities. Mathematics is viewed by the society as the foundation of scientific technological knowledge. It is indispensable part of other subjects like chemistry, biology, physics, and business studies. Learning mathematics is important for individuals because it develops people's critical thinking and makes the world more economically developed (Jablonka, 2020). Mathematics plays an imperative role to a country in terms of economic and technological development. Ashraf, Banerjee, and Nourani (2021) noted that developed nations have appreciated the importance of mathematics and have established very strong mathematics procedures, which in turn propel them to better height of development.

The National Council of Teachers of Mathematics (2020) stated that educational equity in mathematics is a core element of its vision and intent of the principles and standards for school mathematics. Every student should experience a comprehensive mathematics program or curriculum that supports his or her curiosity, interests, and learning. According to this report some students may require additional support like supplementary resources and visual stimulus to meet high expectations in mathematics.

Equity in mathematics is a general concern that has been evidenced for a longer period. The current debate amongst scholars regards what students should learn to be successful in Mathematics (Cosso, & Maeda, 2021). A central and persisting issue is how to provide instructional environment conditions, methods and solutions that achieve learning goals for students with different skill and ability levels. Lee and Wong (2021) stressed the need for education to adopt instructional design techniques to attain higher achievement rate in Mathematics while considering student`s need and comprehension of higher order Mathematical knowledge.

Instructional design provides a systematic process and framework for analytically planning and adapting mathematics instruction (Kim, & Cho, 2022). Instruction design alone cannot produce better learning and achievement. The instructional designer must know crucial factors that build bridges between goals and student performance. Research on these factors will help to utilize limited resources including financial resources and time more effectively (Sahlberg, 2021).

The Kenyan government through the vision 2030 recognized the role of mathematics in science, technology and innovation and strengthened Mathematics with aim of enhancing science and technology (Ameka & Nyakwara, 2020). The government has

introduced projects such as strengthening mathematics and science in secondary education (SMASSE), which empowers secondary school teachers in public schools with more knowledge so that they can implement mathematics curriculum by attaining necessary skills and instructional approaches (Imanda, 2023). The demand, challenges and responsibility of secondary mathematics teachers are enormous. Mathematics teachers not only have to be specialists in the content and pedagogy but also must respond to the needs in society (Ameka & Nyakwara, 2020). Teaching secondary school mathematics is an active cultural intervention that continually develops and advances as a purpose of the needs of the society. Societal influences have altered the role of school mathematics.

Concern over poor mathematical achievement has spread throughout the world. According to the 2022 OECD Programme for International Student Assessment (PISA) research, over 25% of 15-year-olds fared below the EU average in science (23.8%), reading (26.9%), and maths (28.8%) (OECD, 2023a). Since 2018, underachievement has dramatically worsened in reading (+8 pps vs 8.2 pps) and mathematics (+6.4 pps vs an EU average of 7.4 pps) and science (+5.1 pps vs 7.4 pps) (European Commission, 2024a). Across reading and science, boys are more likely than girls to perform below expectations by +7.7 pps and +3.8 pps, respectively (compared to +9.0 pps and +2.7 pps across the EU on average).¹⁰ At the same time, although the proportion of high-achieving pupils stays close to the EU norm in all three subjects, a clear negative trend can be observed in mathematics and reading, both dropping by more than 5 pps since 2012 (DEPP, 2024a). Colwell (2021) evaluated the accomplishment of American students in worldwide Mathematics test and noticed that they were achieving below average. In the Third International Mathematics and Science (TIMS) report, Sahlberg (2021) pointed out that a country's competitive advantage in the global economy is

largely dependent on its educational system. A country must prioritize mathematics and aspire to be a leader in science and technology in this age of technological alignment.

Many scholars, educators, and trainers have been concerned for centuries with determining the factors that affect the quality of education in developing nations. For example, a study conducted in Jamaica by Judicia Nembhard (2024) found that students perform very poorly in mathematics compared to the national average pass rate, which calls for immediate policy intervention. In Pakistan, studies conducted by Bhuttas, M., and Ansari (2024) revealed that overall performance in science and mathematics was poor in both public and private schools, necessitates the implementation of targeted actions to improve overall performance, with a particular focus on public schools.

According to a study by Yahya M (2024) in Nigeria, several factors contribute to senior secondary school students' poor math performance, including their personal status, false beliefs, teachers, students, teaching strategies, language proficiency, teaching and learning resources, parents and family members, schools, policies, society, infrastructures, and the government. This is making it more difficult for them to get further education at tertiary institutions so they can participate in future national advances, and worse, it is driving them to commit crimes since they are unable to get employment in the fiercely competitive labor market.

According to research conducted in Tanzania by Laurent (2024), student participation in mathematics is on the rise, but the pass rate remains poor, averaging just 19.2% over the course of eight years. A substantial problem in mathematics education is shown by the high failure rate, which averaged 80.8%, with many students unable to develop the requisite skills. Additionally, the data indicate that poor performance is predicted to continue, with pass rates by 2030 either remaining below 24% or stagnating or

marginally improving. To improve mathematics performance and prepare students for higher education and careers in science, technology, engineering, and mathematics (STEM) fields, the findings call for immediate educational reforms, such as better teacher preparation, curriculum review, and improved learning resources.

Research by Langat et al. (2022) on achievement of mathematics in KCSE revealed that almost 87% of applicants who took the 2020 math alternative A exam received a score lower than a D+. Additionally, a study by Githaiga, E.W. (2019) on math performance in Kilifi County discovered that low mathematics performance in the KCSE was caused by students' disapproval of mathematics and a lack of resources for math instruction, insufficient instruction materials and inadequate teacher preparation. According to KNEC report (2024) there has been poor performance in KCSE mathematics for the last five years (2019-2023) as shown in Table 1.1

Table 1.1: KCSE Candidate's National Performance in Mathematics from the Year 2019 to 2023

Year	Paper	Candidate	Mean Score (%)	Standard Deviation
2019	1	658904	24.07	21.16
	2	658904	28.82	20.85
	Average		26.45	21.01
2020	1	694445	31	24.04
	2	694347	23	20.90
	Average		27	22.02
2021	1	742796	22.27	19.41
	2	742760	14.45	14.97
	Average		18.36	17.19
2022	1	822376	23.66	19.87
	2	822242	16.39	15.27
	Average		20.03	17.57
2023	1	877215	16.17	16.42
	2	877128	14.22	14.84
	Average		15.195	15.63

Source: KNEC report (2024).

Table 1.1 shows that KCSE mathematics percentage means scores from 2019 to 2023 as 26.45, 27.0, 18.36, 20.03 and 15.195 respectively. The highest mean score is 27% for the year 2019 while the lowest mean is 15.195% for the year 2023. This performance is below average. The mean scores also show a declining trend in performance with time and as the candidature increases. This is a worrying trend that has prompted the researcher to mount a study with a view to changing this trend.

Baringo County is comprised of six sub-counties namely Baringo Central, Baringo North, Koibatek, Mogotio, Marigat and Tiaty. According to the Baringo County Education Office (2024), there were 159 secondary schools in Baringo County in 2023 out of which 113 are public mixed day secondary schools. This implies that public mixed day secondary school accounted for 71% of all the schools in the county. This information contributed to researcher focusing on public mixed day secondary schools.

Table 1.2: KCSE Candidate's Performance in Mathematics in Baringo County from the year 2019 to 2023

SUB COUNTY	MEAN SCORES AND MEAN GRADES PER YEAR					
	2019	2020	2021	2022	2023	Average
Baringo central	3.28	3.63	3.18	3.47	3.03	3.318
	D	D+	D	D	D	D
Baringo north	2.94	3.07	2.92	3.13	2.05	2.822
	D	D	D	D	D-	D
Koibatek	2.77	3.15	2.96	3.01	2.15	2.81
	D	D	D	D	D-	D
Mogotio	2.52	2.76	2.03	2.45	1.66	2.284
	D	D	D-	D-	D-	D-
Marigat	2.01	2.104	1.762	1.875	1.45	1.8402
	D-	D-	D-	D-	E	D-
Tiaty	1.94	2.07	1.56	1.86	1.35	1.756
	D-	D-	D-	D-	E	D-
AVERAGE	3.09	3.36	2.88	3.159	2.34	2.97
	D	D	D	D	D-	D

Source: Baringo County Educational Office (2024)

Table 1.2 shows that KCSE mean scores from year 2019 to 2023 as 3.09, 3.36, 2.86, 3.159 and 2.34 respectively with an average mean score of 2.97 which is a mean grade of D. This performance is below average, and it indicates that many learners do not qualify for courses in tertiary institutions for not attaining minimum grade of D+ in mathematics. Marigat sub-county has an average mean score of 1.8402(D-) for the last five years (2019-2023) which is below the county mean.

1.2 Statement of the Problem

Mathematics is a key subject for the future through both its fundamental development and its enabling role for science, engineering, and technology (Pepin, Biehler, &

Gueudet, 2021). The Kenyan government acknowledges the importance of Mathematics by making it a compulsory subject in both primary and secondary school. The government committed itself to improving performance in Mathematics and Science through in-service training of teachers in projects such as SMASSE and capacity building workshops. Despite all the efforts, there has been a decline of Mathematics performance in K.C.S.E. in the country for the last five years (2019-2023) as shown in Table 1.1. The same observation is also noted in Marigat Sub- County of Baringo County as shown in Table 1.2. When learners score mean grade below D+ in Mathematics K.C.S.E examination, it reduces their career options and thereby limiting their success in tertiary education and beyond. This will result in decline of student's enrolment in tertiary Mathematics courses hence limiting the nation's resource base in science and technology. Marigat Sub County is a unique region in Kenya with harsh climatic condition, very poor land terrain, nomadic nature of the community and a lot of insecurity caused by banditry in the Neighbouring Tiaty sub county. For general perspective and consideration on factors affecting mathematics achievement, studies ought to be done in different region such as Marigat Sub County. This study was geared towards the filling of these gaps in knowledge and population by examining how school-based factors affect learners' mathematics achievement in K.C.S.E amongst learners in public mixed secondary school in Marigat Sub- County.

1.3 Purpose of Study

The main purpose of this study was to examine the effect of school-based factors on learners' KCSE achievement in mathematics in public mixed day secondary schools in Marigat Sub-County, Baringo County.

1.4 Objectives of the Study

The following specific objectives guided the study:

- i. To establish the effect of learning environment factors on academic achievement in mathematics in public mixed day secondary schools in Marigat Sub-County.
- ii. To determine the effect of curriculum implementation factors on academic achievement in mathematics in public mixed-day secondary schools in Marigat Sub-County.
- iii. To examine the effect of teacher related factors on academic achievement in mathematics in public mixed day secondary schools in Marigat Sub-County.
- iv. To establish the effect of learner related factors on academic achievement in mathematics in public mixed day secondary schools in Marigat Sub-County.

1.5 Research Hypotheses

The following hypotheses were tested:

H₀₁: Learning environment factors have no statistically significant effect on academic achievement in mathematics in public mixed day secondary schools in Marigat Sub-County.

H₀₂: Curriculum implementation factors have no statistically significant effect on academic achievement in mathematics in public mixed day secondary schools in Marigat Sub-County.

H0₃: Teacher related factors have no statistically significant effect on academic achievement in mathematics in public mixed day secondary schools in Marigat Sub-County.

H0₄: Learner related factors have no statistically significant effect on academic achievement in mathematics in public mixed day secondary schools in Marigat Sub-County.

1.6. Justification of the Study

The rationale for investigating the effect of school-based factors on learners' KCSE achievement in mathematics in public mixed day secondary schools in Marigat Sub-County, Baringo County, arises from the necessity to tackle inequalities in educational outcomes. These institutions frequently encounter obstacles such as insufficient resources, poor infrastructure, and a lack of qualified teachers, all of which can adversely affect student achievement. Gaining insights into how these elements affect mathematics performance can assist policymakers and educators in formulating targeted strategies to enhance learning environments. Moreover, recognizing effective methods for resource distribution and instructional assistance can help narrow the divide between rural and urban schools, thereby ensuring fair access to high-quality education. Additionally, this research is crucial for guiding evidence-based decision-making in educational policy and practice. By exploring the connection between school-related factors and academic success, stakeholders can adopt data-informed approaches to improve student learning experiences. The outcomes of this study may also aid in the creation of professional development programs for educators, equipping them with the essential skills to tackle the specific challenges encountered by students in remote areas. Ultimately, this research aspires to cultivate a more inclusive and efficient educational

framework that enables students to thrive in mathematics, irrespective of their geographical circumstances.

1.7. Significance of the Study

The importance of investigating the effect of school-based factors on learners' KCSE achievement in mathematics in public mixed day secondary schools in Marigat Sub-County, Baringo County is rooted in its ability to guide targeted interventions aimed at mitigating educational inequalities. Schools located in remote areas such as Marigat sub county frequently encounter obstacles such as insufficient resources, poor infrastructure, and a lack of qualified teachers, which can adversely affect student outcomes. By analyzing the effect of elements such as teacher effectiveness, availability of learning materials, and learner related factors on mathematics achievement, policymakers and educators can formulate strategies to enhance educational results. Furthermore, this research can aid in evidence-based policymaking, ensuring that the distribution of resources and modifications to the curriculum are aligned with the specific requirements of students in isolated regions. Ultimately, the results can reinforce initiatives aimed at fostering a more equitable educational framework that enables all students to thrive in mathematics.

1.8 Scope of the Study

This research was confined to public mixed day secondary schools in remote Marigat sub-county, Baringo County, Kenya, during the 2023-2024 academic year. Situated in a semi-arid zone with challenging terrain and limited infrastructure, the study area's remoteness underscored the novelty of exploring school-based factors in such an environment. It investigated four school-based variables which include learning environment, curriculum implementation, teacher factors, and learner factors and their

specific effects on Form 4 learners' mathematics achievement. Private, boarding, and single-gender schools were excluded to maintain a clear focus on dynamics unique to remote mixed day-school settings.

Data were collected through a mixed-methods approach: structured questionnaires administered to mathematics teachers, focus-group discussions with selected students, systematic classroom observations, and analysis of school records for mathematics scores. Quantitative analysis assessed the strength and direction of relationships between each school-based factor and learner performance, while qualitative analysis explored teacher and student perspectives on how these factors shaped mathematics learning. Out-of-school influences such as home background, community support, and other academic subjects were not examined.

1.9. Limitations

The study was limited to 12 public mixed day secondary schools in Marigat Sub-County that had registered for KCSE. Consequently, findings of the study may not accurately reflect the situation in other categories of schools like private schools and boarding schools. The study focused on Marigat Sub-County because it had the second lowest mean score in Mathematics in Baringo County for the last 5 years. Although Tiaty Sub-County had the lowest mean score in Baringo, the study could not be conducted in this Sub-County because of insecurity challenges. Focus on this area might have limited the generalizability of study findings to other areas that do not share similar characteristics as Marigat Sub-County. The study tried to overcome this limitation by incorporating qualitative methods with aim of adding richness to the findings and offer nuanced recommendations that may apply to other contexts. Further challenges included the poor terrain and harsh climatic conditions which resulted to more cost on transportation and

time wastage. These challenges were addressed by collaborating with local community members who were familiar with the terrain and optimizing travel routes.

1.10. Assumption of the Study

The following assumptions were made for this study.

- i. School management and mathematics teachers are focused towards improving learners' performance in mathematics
- ii. Teaching and learning of mathematics in Marigat Sub County is done according to ministry of education (MOE) guidelines.
- iii. There are no irregularities in KCSE mathematics examinations
- iv. The respondents will give correct and required information.

1.11. Theoretical Framework

This study was based on Robert Gagne's conditions of learning theory (1985). The theory focuses on intentional or purposeful learning outcomes and the events of instruction which provides a framework for learning conditions. He believed that events in the learning environment influence the learning process. Gagne relates learning outcomes to the events of instruction. He gives a systematic statement of theory to illustrate the way instructional events are designed for each of the learning capabilities or learning outcomes. The nine (9) Instruction events include reception (gaining attention), expectancy (informing learners the objective), retrieval (piloting initial stages of learning), semantic encoding (offering guidance to learning), responding (performance elicitation), reinforcement (feedback provision), performance evaluation (retrieval), and improvement of transfer and retention, otherwise stated as generalization. Gagne further describes two different types of conditions that exist in

learning which are internal and external. Internal conditions are Capabilities that occur in a learner before any new learning begins and are transformed during learning. External conditions include different stimulus that are outside the learner such as environment, teacher and learning situations. This suggests that each new learning situation begins from a different point of prior learning and will comprise of diverse external situation depending on the learning environment. These conditions of learning are essential to Gagne's events of instruction.

Gagne's theory suggests that successful learning and improved mathematical performance can stem from both internal and external influences. Exterior conditions encompass the stimuli, guidance, and environment provided by the teacher or learning resources, whereas internal conditions pertain to the learner's prior knowledge, cognitive functions, and motivation levels. By recognizing and carefully managing both types of situations, teachers can create more effective learning experiences that enhance students' understanding of mathematics and their problem-solving skills. This will ensure lessons are well-organised, concepts are explained clearly, and students get chances to practise and receive feedback.

In context of this study, this theory could help in understanding how factors within schools, like the quality of teachers, access to resources, classroom atmosphere, and assessment methods, directly affect how well Gagné's instructional steps are put into practice. For example, teachers who are well-trained are more likely to use a variety of teaching strategies that fit with Gagné's approach, while schools with plenty of resources and a supportive environment can boost student engagement and offer personalised support. Ultimately, successfully applying Gagné's theory in

mathematics lessons relies heavily on these school related factors, which together influence learners' performance and achievement in the subject.

Gagné's framework served as the foundation for the study, which focused on how the curriculum and learning environment may be developed to enable learners in distant Marigat to take charge of their own mathematics education. Learner aspects like self-regulation and motivation were evaluated in terms of how students interacted with scaffolded activities and peer collaboration, while teacher elements such as the capacity to encourage inquiry and offer prompt feedback were analysed through the prism of each instructional event. This alignment made it possible for the study to examine relationships between school-based factors and achievement as well as to shed light on the ways in which a student-centered, event-driven design promotes greater comprehension and enhanced mathematical performance.

1.12 Conceptual Framework

Conception framework was used as a model to demonstrate the interrelationship of concepts under study. It shows relationship between independent and dependent variables. Concepts are constructed into variables based on research objectives to maintain focus on the study area. The framework positions four independent variables which include learning environmental factors, curriculum implementation factors, teacher-related factors and learner-related factors which are direct drivers of learners' academic achievement in KCSE. Each set of factors contributes unique support or constraints that shape learners' achievement. The intervening variables are Age, gender and work experience which modify these relationships by strengthening, weakening or redirecting the influence of the independent variables on performance. Together, the independent variables interact through the lens of the intervening variables to determine

the dependent variable, learners' academic achievement in KCSE. This holistic view highlights not only which factors matter most but also for whom and under what conditions they most strongly affect exam. Figure 1.1 shows interplay between the independent, intervening, and dependent variables.

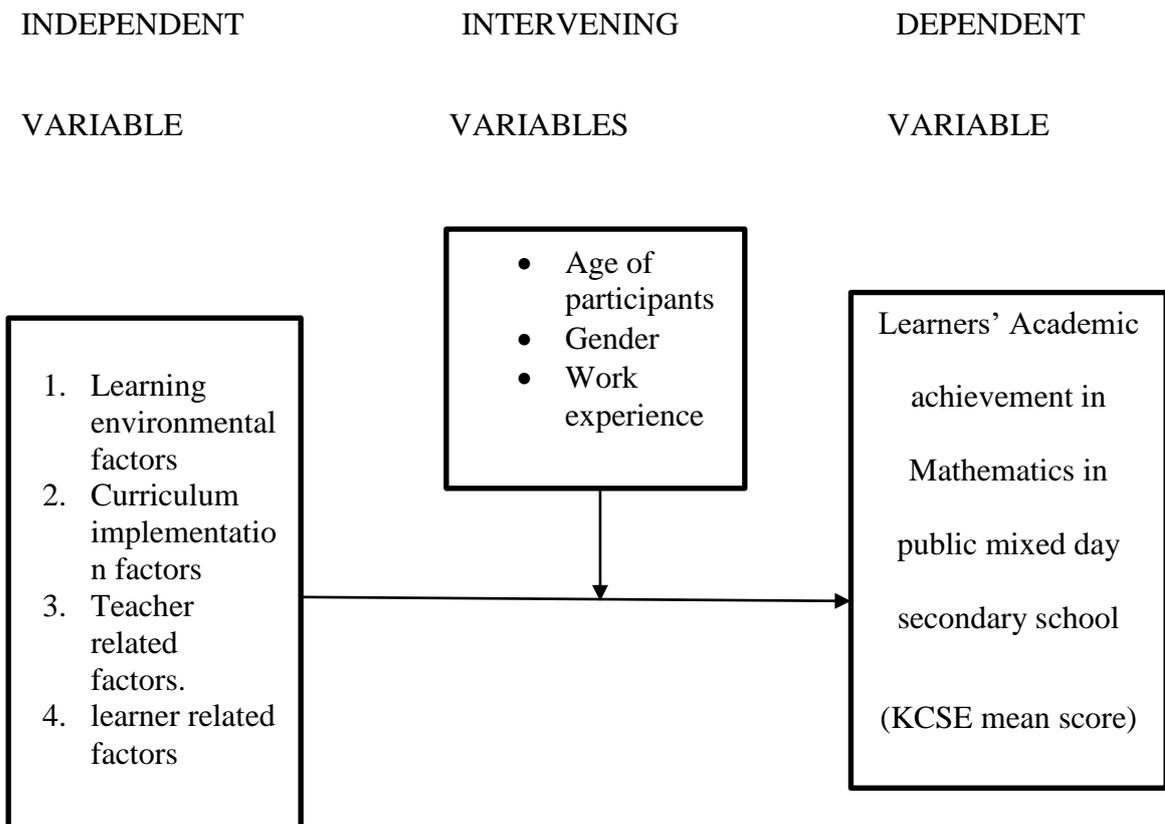


Figure 1.1: Conceptual model showing variables interrelationships.

Source: Researcher, (2024)

1.12.1 Learning Environment Factors

Learning environment factors pertain to the circumstances, resources, regulations, methods, and general environment present in a school that affect students' learning experiences and academic outcomes. These elements are manageable by the school and can either facilitate or obstruct student success in areas such as mathematics. Environmental factors within schools significantly influence students' attitudes, learning opportunities, and overall performance in mathematics

1.12.2 Curriculum Implementation Factors

Factors influencing the implementation of the school-based curriculum pertain to the internal aspects within a school that affect how the intended curriculum is taught, understood, and applied by educators and students. These consist of factors related to teachers, leadership, instructional materials, characteristics of learners, school culture, and methods of assessment. Successful implementation of a school-based curriculum is essential for enhancing Mathematics performance.

1.12.3 Teacher Related Factors

School-focused teacher-related elements pertain to the characteristics, actions, and methods of teachers in the school setting that affect educational results. These elements encompass teachers' qualifications, instructional techniques, experience, attitudes, motivation, classroom management abilities, and opportunities for professional growth. Factors related to teachers, including their qualifications, teaching methods, experience, and motivation, directly influence the way mathematics is instructed and understood. When these influences are robust, they foster an atmosphere where students can excel in mathematics and attain improved academic results

1.12.4 Learner Related Factors

Factors related to learners within the school context pertain to the unique traits and actions of students that are impacted or molded by the school setting, and which have a direct or indirect influence on their academic results. These consist of factors like: Attitudes and motivation regarding learning, Self-efficacy and confidence levels, Study habits and preferred learning styles, Behavior and participation in class, Peer interactions and influences. Skills in time management and goal setting are learner-related aspects that significantly affect mathematics achievement

1.12.5 Achievement in Mathematics

Mathematics achievement indicates the degree of success or expertise that individuals show in comprehending and utilizing mathematical concepts, skills, and problem-solving methods. It is usually evaluated through different assessments, including tests, examinations, or performance tasks, and demonstrates a person's capability to utilize mathematical knowledge in practical or theoretical situations. Mathematics success can be affected by several elements, such as educational quality, instructional techniques, personal interest and drive, socio-economic status, and availability of resources. Excelling in mathematics is frequently linked to improved academic success and enhanced career prospects in professions that demand robust quantitative and analytical abilities. In this study, academic achievement in mathematics was measured using mean score in KCSE examination.

1.13 Operational Definition of Terms

Academic achievement: Refers to the degree to which a student, educator, or educational institution has effectively fulfilled learning outcomes. It is typically assessed through standardized testing.

Assessment: is the process of evaluating students' understanding, skills, and problem-solving abilities in mathematical concepts.

Culture of mathematics refers to the set of beliefs, values, practices, social norms, and ways of thinking that are shared by mathematicians and others who engage deeply with mathematics

Curriculum implementation factors: The elements that influence how a planned curriculum is effectively applied in educational settings such as method and practices used to facilitate learning.

Environment factors: refer to external conditions that influence students' ability to acquire knowledge and skills effectively.

Learner factors: refer to the individual characteristics and external influences that affect a learner's ability to acquire knowledge and skills in mathematics.

Learners: Are students registered for four years in secondary education.

Learners' achievement: Refers to demonstrated knowledge and comprehension across different areas of the subject, as measured by standardised tests like the KCSE.

Learning environment: space in which students feel safe and supported in their pursuit of knowledge and is inspired by surrounding.

Performance: refers to the measurement of students' academic success, teachers' effectiveness, and overall institutional quality.

School based factors. refer to the internal elements within a school that influence academic performance of a learner and are within the school's control, this include learning environment, curriculum implementation, teacher related and learner related factors that affect learners' academic achievement in mathematics.

Teacher factors: refer to the various elements related to mathematics educators that influence student learning and academic achievement.

CHAPTER TWO

LITERATURE REVIEW

2.0 Overview

This chapter deals with literature review which will address the knowledge gap. Empirical and theoretical literature formed foundation on effect of school-based factors on achievement of mathematics in KCSE among learners. The main purpose of literature review is to discover inconsistency in areas to explore in the research where there is incompatibility in preceding survey and where previously questions not answered or questions left open. This topic is organized under the following subtopics: learning environment factors, curriculum implementation factors, teacher related factors and learner related factors.

2.1 Effect of Learning Environment Factors on Academic Achievement in Mathematics

Learning Environment factors in a school are the internal conditions of the school that affects learners' academic achievement. These include physical, psychological, and emotional potentials of learners. Many students fail to develop universally their potential because of inadequacy on learning environmental stimulation (Henderson, & Cunningham, 2023). Also, a study done by Mahoney (2021) noted that staff office, classroom space for learners represented the major areas that largely influence academic achievement of learners in public schools. The study also indicated that desk, current books and library are school environmental factors that have effect on academic achievement. Edward and Passy (2022) found out from their studies that students from schools with adequate facilities, good teachers and favourable environment, perform better than those students from schools with fewer facilities and less enabling environment, further they indicated that things like lack of infrastructure dormitories,

laboratories, library, staff house and classroom lead to poor performance in community based secondary schools.

In his study, Cheng (2022) classified school learning environment into four types physical, school product and services, school system and processes which all affect teaching and learning in any given institution. The physical environment refers to the tangible aspect of the school like design of classrooms, safety and comfort, resource and facilities. School products and services include elements like the school curriculum, extracurricular activities and support services like meals and counselling. School systems refer structures that aid the functioning of the school like the leadership and administration, school policies and regulations. School processes are the day-to-day operations and interaction within the school including teaching, assessment, evaluation, and communication.

On the other hand, Rusticus et al. (2023) classified school environment into three categories: psychical, social and cultural. The physical environment refers to tangible aspects of the schools including classroom design and availability of resources. Good physical environments characterized by adequate, spacious and well-lit classrooms that are equipped with requisite resources enhance students' focus and motivation. The physical environment may also encompass climate conditions like temperature, precipitation, and wind. According to analysis done by Gündoğdu and Ali (2022), temperature and air quantity are essential entities in school's environment which affects learners in arid and semi-arid areas (ASAL) where temperatures are usually very high. The climatic conditions interact with the physical infrastructure in school to determine the student comfort. High temperatures and lack of air circulation makes learners sleepy and lack concentration on their studies, they further noted that academic achievement in the ASAL regions has been significantly below the required standards due to harsh

climate conditions making learners to disrupt classes in afternoon (Mora et al., 2025). Climatic conditions are significant condition in according to learners with a nice conducive support for learning.

Lekwa, Reddy, and Shernoff, (2019) showed a positive and substantial relationship between most of the teaching and learning resources, level of classroom management and Content delivery. Njoroge, (2023) on determinants of students' academic achievement in public secondary schools in Machakos County, opinion that lack of appropriate facilities and textbooks contributes extensively to poor performance. Same revelation was noted by Mulenga, (2022) who identified the lack of school facilities and equipment as being a significant basis of underperformance in secondary schools.

In modern world, the use of educational technology is of great importance in learning. Sermon,(2020) suggested that technology has the potential to transform leaning environment from passive to active and more after the control of the learners. Brahier, (2020) pointed out that teachers ought to integrate teaching media when teaching to enhance teaching and learning experience. Similar study done by Anthony, and Walshaw, (2023) noted that teachers can realize effective teaching when they employ suitable instructional resources. Teachers must plan to utilize instructional resources efficiently and effectively; however, they always face drawback if these instructional resources are not availed to them in their school environment.

The social environment refers to the relationship dynamics among students, teachers, school administrators, parents and other stakeholders (Rusticus et al., 2023). The interaction between stakeholders shapes the learning atmosphere in a school. Positive interactions promote cooperation, inclusivity, respect, and sense of belonging leading to enhanced learning outcome. The study by Gutierrez and Doronio (2024) found

secondary school students in Philippines were highly engaged with Mathematics where the classroom social environment was favourable in terms of teacher providing support and mutual respect. The study revealed that the classroom social environment was greater determinant of students' engagement with mathematics than setting of performance goals. The study emphasizes the importance of better teacher-student interaction typified by recognition of students' accomplishment, creation of friendly learning environments and provision of constructive criticism.

Similarly, Padilla et al. (2023) found that parental participation and support was positive associated with Mathematic achievement among secondary school students in Mexico. The study highlighted the importance of involvement of parents in school activities like information meetings and parent support in terms of assisting with homework and motivating them. On the other hand, Yu et al. (2023) found student-peer relationships had a more profound effect on academic achievement than student-teacher or student-parent relationships. The result indicates that secondary school students value peer acceptance, which creates a sense of belonging. This sense enhances their motivation to learn, behave in a socially appropriate way, concentrate on learning, and become more engaged in academic activities. Peer acceptance also enhances the support that a student receives from peers.

Apart from relationship, the school social environment encompasses other aspect like security and safety for students, teachers and other stakeholders. Berkowitz, (2022) revealed that insecurity in school environment significantly affect academic achievement of learners in high school Using detailed and school fixed effects approach, this means a school where learner feel insecure will lead to absenteeism from school hence leading to low achievement. Moreover, study by Lubis et al. (2022) noted that in some environment where there is no security there have been no appropriate

learning, students become uneasy to learn and lack concentration in class because of disturbances due to presence of police officers in tracks and helicopters patrolling the area to give security.

The cultural environment encompasses school values, norms and expectations that shape the behaviours and experiences of students, teachers, and other stakeholders (Rusticus et al., 2023). Positive school cultures that emphasize excellence and high performance often lead to better learning outcomes than negative school cultures that tend to promote lack of enthusiasm. The study by Liu et al. (2022) established that schools that had cultures that establish line of authority and enforce a strict disciplinary climate tend to promote effective learning. Cultures that promote quality instructions, classroom management, cognitive activation, and assessment and feedback also lead to better academic performance.

School culture is closely related to the concept of school climate. School climate is the internal condition of a school that creates a conducive atmosphere for learners which is safe and secure (Ismail et al., 2020). Research has shown that student's perception of school climate significantly explains physiological identification with the school. Perry, (2023), also indicates that school climate and discipline such as bullying is related to school safety and achievements. This implies that there is a link between the school social and cultural environment and that both interact to shape students' achievement.

In Tanzania, Begenyeza et al. (2021) found that there was an association between school culture and students' attitude towards the learning of Mathematic. It was observed that schools whose teachers encouraged students, provide feedback to student, and use alternative instructional methods like study recorded positive attitude towards learning of mathematics among students. Positive attitude is likely to translate to better

performance. In Kenya, Mugo et al. (2024) examined the effect of school culture on the performance of secondary schools' students in Laikipia North and Nyahururu Sub-Counties in the Mathematics subject. Results showed most of the secondary schools were characterized by culture that emphasizes frequent assessment of students, optimal scheduling of Mathematic classes, and motivating students on the mathematics. This culture was positively associated with Mathematic performance among students. Njoroge et al. (2024) further observed that public secondary schools in Nyandarua County whose culture emphasized instructional supervision and optimal evaluation of learning outcomes recorded better performance in Mathematics than their counterparts. These studies highlight the school culture is an important determinant of Mathematic achievement even in the African context.

In this current study, I explore how various aspects of the learning environment such as physical space, classroom atmosphere, teacher-student relationships, and access to resources shape student learning outcomes. The existing literature strongly emphasizes the value of well-designed physical settings, emotionally supportive climates, and positive teacher interactions in fostering engagement and academic success. However, key gaps remain. While much attention is given to infrastructure, less is said about the more nuanced social and emotional dimensions of the learning environment particularly how factors like student well-being, inclusivity, and peer relationships contribute to meaningful learning experiences.

Additionally, the role of technology in shaping modern learning environments is frequently examined, but there is limited research on how to ensure equitable access to digital tools, especially in under-resourced schools. Furthermore, studies typically focus on mainstream education settings, leaving a gap in understanding how learning environments affect students with special needs or those from marginalized

backgrounds. These gaps suggest a need for more integrated and context-sensitive research that considers both the tangible and intangible elements of learning environments across diverse student populations.

2.2 Effect of Curriculum Implementation Factors on Academic Achievement in Mathematics

The term curriculum refers to the structure that stipulate learning outcomes that students are expected to attain, the activities they are expected to partake and the content that they are expected to master (Wasagu & Kabir, 2022). The curriculum stipulates in advance what a student ought to do and what they are expected to achieve at the end of a given period. On the other hand, the term curriculum implementation refers to the day-to-day undertaken in a school to execute the tasks stipulated in the curriculum with the aim of realizing set objectives (Nshimiyimana and Andala, 2024). It is the process of translating the curriculum document into an operating curriculum. There is always a gap between the curriculum document and operating curriculum due to implementation challenges.

According to Şeyma and Özdemir (2022), some of the curriculum implementation challenges include teachers' inadequate presentation, pace of work, unsuitability of learning resources, topics sequence and language level. The teaching is usually the most important agent of curriculum implementation. The teacher usually translates the curriculum into a syllabus, scheme of work, and lesson plans to deliver to students. The teacher is important in determining teaching methodology because he or she decides and create the type of learning activities and suitable learning resources. Yu (2022) opines that for teachers to implement the mathematics curriculum effectively, they must fully master the philosophical ideas, theories, and methods used in this subject. Abramovich et al. (2019) noted that teaching style and methodology in mathematics should include

opportunities for exposition by the teacher which include discussion with appropriate practical activities with consolidation and practice of fundamental skills and routines.

Shawer (2020) instituted out the guidelines on the delivery of the curriculum in the syllabus and teacher's guidebooks. He recommends teachers to use investigation methods which are directed towards learning tasks which encourage inquiry, creativity, manipulative and manual skills. He further noted that overloaded curriculum affects the teacher's methodology to cover the syllabus. Mathematics will end up being taught theoretically and students are not given time to discover things for themselves. Gündoğdu and Ali (2022), in their study concluded that practical activities enhance the understanding of mathematics regardless of the learner's age. They pointed out the use of teaching activities in mathematics which provide opportunities for full involvement of the learners in learning hence allowing free interaction with situations in real life. Yu (2020) stressed the importance of teachers' ability to integrate, enrich, excavate, and innovate resources from Mathematics curriculums. There is need to shift from the examination results-focused culture to a culture that prioritizes the development of requisite Mathematical concepts among students.

In recognition of importance of teachers in the delivery of curriculum, government across the globe have introduced different programmes for enhancing the capacity of teachers. The study by Dudley et al. (2018) found that after going through a six terms training programme, 70% of teachers in Britain were able to demonstrate better teaching practices like dedicating more time towards the consolidation pupils' learning. The use of alternative teaching approaches like "talk partners" that give students time to talk about the Mathematic concepts they have learnt, also became prevalent among 40% of the teachers. Teachers also learned to slow down the introduction of new concepts to ensure that pupils are grounded in the comprehension and application of already taught

concepts. Training programmes also help to get buy-in from teachers, which aim in the implementation of curriculum. The study by Johnson et al. (2019) found that 55.6% of teachers in Ireland did not believe that the teaching methodologies included in the Mathematic curriculum would impact students learning positively. These teachers were not convinced of the benefits that students will acquire when the teachers embrace the changes to pedagogical practices proposed in the curriculum document. The lack of beliefs in the curriculum methodologies may hamper its implementation as teachers may feel anxious and uncertain about how best to implement.

Curriculum implementation is also a function of resource of availability. Chirimhana et al. (2024) found that the implementation of Mathematics curriculum in Namibian secondary schools was hampered by lack of adequate resources like textbooks and library facilities. Learners in schools with inadequate resources experienced difficulties attain the required standards and same level of comprehension as learners in resource rich schools. Activity based methods of teaching also depends on incorporation of suitable learning resources. The use of resources is central in ensuring the learners develop an appreciation and enjoyment.

Many mathematics teachers are knowledgeable in their area, but a large segment of them cannot finish their courses because of time constraints (Patel, 2022). Mathematics teaching is affected by time limitations and the difficulty of providing adequate instructional time, as shown by various researchers (Smith, 2020). Holloway (2021) discovered that educators encountered a major challenge stemming from restricted time caused by a large number of classes and students. In a study carried out in Uganda, Mugunda (2023) agrees with Mendez (2023) that a lack of time restricts people's capacity to engage in activities. Multiple participating teachers noted that the task of teaching mathematics required more time commitment than other subjects. Numerous

studies have shown that a teacher's experience and age influence the teaching and learning of mathematics (Mendez (2023).

This study by Moses et al. (2024) explored the challenges faced by mathematics teachers in implementing the revised NSSCO curriculum in the Oshakati Circuit, Namibia. Through interviews with 15 educators, the research identified significant obstacles including inadequate resources (textbooks, facilities), the English language as a medium of instruction barrier, high learner absenteeism, insufficient time for content coverage, overcrowded classes, and a lack of parental involvement. Although the study highlights the negative impact of these factors on curriculum implementation, it does not assess how curriculum implementation affects students' achievement in Mathematics.

In Kenya, Hassan and Okutoyi (2024) observed that the implementation of Mathematic curriculum in secondary schools for the deaf was hampered by inadequate resources, inadequate teaching methodologies, and insufficient time allocation for Mathematics lessons. Implementation was also hampered by the content of the curriculum that incorporate complex topics and language that did not make provision for learners with disabilities. On the other hand, Njiru et al. (2020) observed that 60% of Mathematic teachers were using poor teaching methods, which was a major barrier to the effective implementation of the mathematics curriculum. The authors further noted that poor teaching methods had been naturalized by performance ranking of schools that prompted Mathematics teachers to adopt an examination-focused teaching approach.

In this current study, I examine curriculum implementation through the lens of key influencing factors, including teacher preparedness, resource availability, administrative support, and the alignment between curriculum design and actual classroom practices.

While existing research highlights these elements as critical to successful implementation, significant gaps remain particularly in understanding how these factors operate together within real educational contexts.

Much of the research tends to focus on the challenges of implementing top-down, nationally prescribed curricula, but there is less attention given to how local contextual factors, such as community values or school culture, shape implementation outcomes. Additionally, studies often overlook the role of ongoing teacher training and professional development in adapting to curricular changes, assuming that initial training is sufficient. Another gap is the insufficient exploration of how technology integration and digital tools impact curriculum delivery, particularly in diverse and low-income settings. These gaps suggest a need for more contextually sensitive research that considers the dynamic interaction between curriculum, educators, students, and the broader educational ecosystem

2.3 Effect of Teacher Related Factors on Academic Achievement in Mathematics.

In their study on constructivist theory, Dunne et al. (2021) opined that learning theory gives teachers another perspective to rethink how students learn and to focus on process and provide ways of documenting change and transformation. They further remind teachers to look for different ways to engage individual students and develop rich environment for exploration, prepare coherent problem sets and challenges that focus the model building efforts and elicit and communicate student perception and interpretations.

Er et al. (2021) observed that when children were tested on tasks on their own, they rarely did as well as when they were working in collaboration with an adult, who assists them to refine their thinking or their performance to make it more efficient. In the

constructivist's classroom methodology, teachers' role is to prompt and facilitate learning. Teachers focus should be guiding learner by asking questions that will lead them to solve a given problem on their own. They further state that learning environment should be designed to support and challenge learners' thinking. Dziubaniuk and Nyholm, (2021) pointed out from their study that in teaching students to learn in a constructivist methodology requires a teacher to be a guide or facilitators of knowledge. Learning environment therefore should be authentic, lessons should be relevant to students and should be encouraged to reflect upon what they learn and be evaluated to discover their educational needs.

Pan (2023), in his research argue that teacher commitment and engagement have been identified as most critical factors in the success and future of education. Commitment contributes to teachers work performance, absenteeism, burnout, and turnover as well as having influence on students' academic achievement. Dottin (2023) noted that teacher commitment is a Central factor to an effective schoolteacher, satisfaction and retention. Low level of teacher's commitment results into decreased learners' achievements. Toros et al. (2021) wrote that teachers, who are committed, always see their learner's welfare, responding to and meet student's needs. They work towards improving on their practices; they work as a team with other teachers, prepare lessons and make teaching a lifestyle.

Chen et al. (2021) argues from their study that the pedagogy used in classroom is determined by the philosophies the teacher holds about mathematics. Beliefs a teacher hold about mathematics has great impact on the teaching of mathematics and learning in the classroom. It shapes the pedagogy which teachers use hence the response they obtain from their students. According to Boaler (2022), assigning mathematics homework allows students to practice and reinforce what they have learned in class,

leading to improved retention and understanding of mathematical concepts. Furthermore, feedback from assignments can help students identify their weaknesses and improve their areas of difficulty (Killen & Toole, 2023).

Perera and John (2020) argue that teacher's belief about mathematics has a powerful impact on the practice of teaching. A teacher with negative belief about mathematics influences his or her students negatively. Thibaut et al. (2018) showed that classroom strategies used to teach a subject are influenced by teacher attitude, which in turn influences students' attitudes towards a certain subject. This implies that teacher's attitude, towards the subject will automatically produce same attitude on their learners. It is therefore true that teachers who hold learner-centered belief would translate into their classroom practices greater enthusiasm toward engaging their learners in acquiring mathematical concepts. Ayebale et al. (2020) opines that teachers' attitude towards Mathematics also shape the students' attitude because students use teachers' temperament to develop their own attitude. This implies that positive attitude on the part of the teacher is likely to result in positive attitude on the part of students and vice versa.

Dogrukok and Kurnaz (2023) urged in their study that teacher's preparation is vital for effective teaching and learning process. Effective teaching includes preparation, implementation, and evaluation. In preparation they said that the teacher refers to the syllabus to make the scheme of work and lesson plan. In implementation, the teacher is involved in the actual teaching of the content, class management and using teaching and learning materials to archive the specified lesson objectives. Evaluation is administered in form of continuous assessment and end term examinations (Ayebale et al., 2020). They define class management as involving creation of stimulating and captivating environment in which affective teaching and learning can take place. Further they said, to achieve effective class management then students should be grouped, observe class

routine and class organization which will involve group siting arrangement and ensuring equipment's for mathematics lessons are placed in positions which are easily accessible.

For educators in mathematics, keeping motivation high is crucial for promoting student learning and growth (Han et al., 2022). Research indicates that teacher motivation can greatly influence student learning, enthusiasm for learning, and success in mathematics (Yana and Husnita, 2023). The motivation of mathematics teachers influences classroom dynamics and impacts elements that affect classroom activities, teaching and learning assignments, and assessment methods (Karataş, 2022). TIMSS evaluates teacher motivation by examining their satisfaction, enthusiasm, inspiration, and pride in their profession, all of which contribute to teachers' dedication (International Association for the Evaluation of Educational Assessment (IEA), 2021)

Mathematics teachers face numerous challenges that can affect the quality of their instruction, the resources they employ, and the learning of their students (Karah, 2022). These difficulties consist of limited resources, student motivation and engagement issues, and insufficient parental support for their children (Van de Walle et al., 2022). Restricted resources affect their capacity to create captivating and impactful learning experiences, while the heavy workload—from lesson planning, grading, and administrative duties—frequently challenges their professional endurance (Chew & Cerbin, 2021). Connecting classroom mathematics to students' daily experiences is a challenging endeavour, particularly when instruction is influenced by standardized tests or outside performance requirements. Discovering and connecting mathematics to real-world significance may seem like pursuing elusive stars. Additionally, mathematics educators regularly face the widespread belief that their subject is fundamentally challenging, an essential endeavour for building student confidence and perseverance (Li & Schoenfeld, 2020)

This current study builds on the literature that highlights teacher qualifications, experience, teaching skills, and motivation as key drivers of student performance. While countless investigations link measurable metrics like years in the classroom and formal certifications to improved learning outcomes, they often leave out the subtler, human-centred aspects of teaching.

By bringing teacher student relationships and a teacher's adaptability in diverse classrooms into focus, this research addresses a crucial blind spot. In doing so, it moves beyond counting credentials and experience to explore how trust, empathy, and flexibility shape academic success in ways that standardized indicators alone cannot capture. Furthermore, many studies are specific to certain contexts, which limits their applicability in different educational environments. There is also a lack of research examining how ongoing professional development and teacher well-being influence teaching effectiveness. These gaps highlight the necessity for more comprehensive and long-term studies that combine both quantitative and qualitative methods to gain a deeper understanding of the diverse roles' teacher play in education.

2.4 Effect of Learner Related Factors on Academic Achievement in Mathematics

Academic achievement in Mathematics is also determined by factors that are inherent to the student like Mathematic self-concept and self-confidence, attitude towards the subject, study habits, and drive. Wardat et al. (2020) found student characteristics accounted for 4.7% of variances in students' Mathematics score in United States of America (USA) and 7.4% in Australia with the percentages changing to 12 and 19.3% when classroom and school variables are controlled. A study by the National Centre for Education Statistics (2020) found that students who were highly engaged and motivated in Mathematics classes had higher achievement than their counterparts. This implies that students' level of motivation and engagement in the subject also determines their

academic performance. Wardat et al. (2023) also found that peer influence play a big role with students with positive friends recording higher performance than students with disruptive friends. Positive friends serve as a source of motivation and support.

According to Quintero et al. (2020), academic achievement in Mathematics is determined by the student's affective mathematic engagement. They defined affective engagement as the subjective sentiment towards mathematics that encompasses the student self-acknowledgement, emotion, attitude and value. Student's affective mathematic engagement affects academic achievement by shaping the student's interest towards the subject. Bicer et al. (2020) noted that there is a general lack of positive affective mathematic engagement among students across the globe. Many students are exhibit feelings of tension, hopelessness and fear towards the mathematics subject. On the other hand, Lee et al. (2023) found that student's affective mathematic engagement was significantly linked to demographic factors like students' gender, home language and immigration status. This implies that the student cultural and socioeconomic background can also influence achievement in Mathematics by shaping the student's affective mathematic engagement. Ayebale et al. (2020) noted that the stereotype that boys do better in Mathematics than girls is common in many societies. This stereotype tends to affect the attitude of girls towards Mathematics leading to low achievement. The perception that Mathematics is a male dominated subject lowers the confidence of girls leading to low performance.

Valverde-Berrocoso et al. (2022) studied the attitudes of students in secondary school in relation to mathematics performance and found positive relations. Attitude refers to a student's personal feelings, beliefs and emotional responses towards Mathematics as a subject. This concept has an affective component that capture emotions like anxiety, confidence, enjoyment and motivation towards Mathematics. Ayebale et al. (2020)

found that due to their attitude, many students perceive Mathematics as a rule-oriented and procedural subject preventing them from experiencing its richness. Rincon, C ezar and Hernandez (2020) established in their studies how students' attitude towards mathematics subject has a direct bearing on their academic performance. Students' personal motivation (intrinsic and extrinsic) plays a role towards their academic performance. Soltani et al. (2022) delineated that student motivational characteristics such as self-exploration and career focused have impacted on their academic performance.

Another student related factor that comes close to attitude and affective mathematic engagement is students' self-concept towards Mathematics. This refers to learners' perceptions regarding their capacity to learn and apply Mathematical concepts (Lee & Kung, 2018). Students who perceive themselves to be skilful and capable of learning Mathematics are more likely to achieve highly in the subject and vice versa. Positive self-concept brings positive attitude and affect towards Mathematics. A student with positive self-concept tends to enjoy Mathematic lessons leading to enhanced engagement and high comprehension. A student self-concept can be shaped by other factors like teacher attitude, teacher skills, learning environment, and gender (Peteros et al., 2020). Schools in communities that perceive Mathematics as a male dominated subject are likely to have positive self-concept among boys and negative self-concept among girls.

In addition, Wang et al. (2023) found a connection between student discipline and achievement in Mathematics. Their student showed that students with high absenteeism, who lack punctuality and have many incidents of misbehaviour, had low academic achievement in Mathematics. Student discipline has major implication on students' concentration and engagement in class as well as the student relations with teachers and

peers. These implications have an influence on students' academic achievement in Mathematics. Lubis and Wangid (2019) also found an association between disciplinary issues like obedience, being orderly and being meticulous have an influence on students' achievement in Mathematics.

Yang and Wang (2022) noted in their study that learner factors that distress their academic achievement could be categorized into internal and social factors. They institute that internal factors that influence students' academic performance which include interest in content of a subject, internal gratification, and ambition while social factors include social respect and material reward. Haynes et al. (2023) pointed out that student attitudes to school and their interest in learning effects their academic achievement. Yang et al. (2022) pointed out that there is a constructive relationship between students' attendance to school and academic achievement using correctional approach. Ancheta, Daniel and Ahmad (2021) further established out a significant relationship in student school attendance on academic achievement.

Chowa et al. (2023) indicated that differences in attitudes toward the course accounted for 12 to 20% of the overall variability in achievement. Wang et al. (2024) examined the elements linked to 8th graders' math performance in four countries utilizing TIMSS-2003 data. They found that confidence in math learning had the most substantial significant impact on math achievement in the USA, Russia, Singapore, and South Africa. In the same vein, the research by Ker (2023) showed that self-assurance is the most significant factor affecting math performance in both Singapore and the USA. Aligned with self-confidence, motivation is another important element that accounts for students' success (Yilmaz, Ö. (2022)). Motivation factors regarding math assess students' feelings towards mathematics, their valuation of the subject, and their views on learning it (Liu, F., Liu, Y., & Wang, F. (2024)). Absenteeism is another important

factor and negatively correlates with academic performance (Gottfried, 2024). As stated by Liu, J., & Lee, M. (2022), chronic absentees typically achieve test scores that are 0.05σ to 0.11σ lower than those of average absentees. Similar to absenteeism, the feeling of belonging at school is another element influencing math achievement. It refers to how much students perceive themselves as accepted by and linked to their peers and integrated within the school community. A feeling of belonging provides students with a sense of security, identity, and community, which subsequently fosters their academic, psychological, and social growth (OECD, 2020).

In this current study, the focus is on learner-related factors that influence academic success, including motivation, learning preferences, socio-economic status, prior knowledge, and self-regulation. While existing research acknowledges the importance of these individual elements, notable gaps persist. Much of the literature examines these factors in isolation, without fully exploring how they interact within the dynamics of real classroom settings. Moreover, there is minimal investigation into how emotional and psychological health affects learning, particularly in challenging or high-pressure environments. Research frequently generalizes results among various learner groups, ignoring distinctions related to culture, language, or specific educational requirements. Moreover, a limited number of longitudinal studies monitor how factors related to learners change over time and influence long-term educational results. These gaps emphasize the necessity for more thorough, inclusive, and context-aware research.

2.5 Chapter Summary

This chapter provides an in-depth review of the literature on school-based factors that influence student outcomes, focusing on the learning environment, curriculum implementation, teacher-related factors, and learner-related factors. The learning environment is widely regarded as a crucial factor in student achievement, with research

emphasizing the importance of both the physical space and the emotional climate of the classroom. Studies suggest that a well-organized physical environment, with adequate resources and appropriate classroom layouts, contributes to higher levels of student engagement. However, the literature often overlooks the less tangible aspects, such as the social and emotional climate, including peer relationships and psychological safety. While some studies acknowledge the importance of these elements, there is a significant gap in exploring how emotional well-being and classroom inclusivity influence academic outcomes. Additionally, Few studies integrate analyses of how the physical setting interacts with factors like school culture, teacher-student relationships, and community engagement, particularly in diverse and under-resourced contexts

Curriculum implementation is another critical factor examined in the literature, with a focus on the alignment between curricular goals, teacher practices, and available resources. Research indicates that teacher preparedness and professional development play a pivotal role in the successful implementation of curriculum. However, much of the existing literature focuses on the challenges of implementing nationally mandated, top-down curricula, without considering the role of local context in shaping curriculum effectiveness. There is limited exploration of how regional or community-specific adaptations to the curriculum might better address the needs of students in diverse settings. Furthermore, the role of ongoing professional development in helping teachers adjust to changing curricula and pedagogy is often underexplored, with many studies concentrating only on initial teacher training. The need for more longitudinal research on how curriculum adjustments are sustained over time remains a gap in this area.

Teacher-related factors, such as qualifications, experience, and pedagogical skills, have been extensively studied and are widely recognized as impacting student achievement. The literature typically highlights the importance of these quantitative aspects in

determining effective teaching. However, less attention is given to the qualitative dimensions of teaching, such as emotional intelligence, teacher-student rapport, and the ability to adapt to diverse student needs. While teacher motivation and job satisfaction are acknowledged as critical factors, the impact of teacher well-being, particularly in challenging or low-resourced environments, remains underexplored. Research tends to focus on the early stages of teachers' careers, without sufficient attention to their professional growth over time. Longitudinal studies that track teachers' evolving practices and their influence on student outcomes are rare, creating a gap in understanding how sustained professional development can enhance teaching effectiveness over the long term.

Learner-related factors, including motivation, socio-economic status, prior knowledge, and learning styles, are well-established in the literature as key determinants of academic success. However, much of the existing research isolates these factors and examines them independently, without considering how they interact in the complex, real-world context of a classroom. For instance, socio-economic background is frequently discussed as a standalone variable, but there is limited exploration of how it intersects with other factors, such as emotional well-being, cultural differences, and access to educational resources. Moreover, much of the research generalizes across diverse student populations, overlooking the needs of marginalized groups, students with disabilities, and those from non-mainstream educational backgrounds. There is also a lack of longitudinal studies that track the impact of these learner-related factors over time, particularly on long-term academic achievement. Addressing these gaps requires a more holistic approach that examines the dynamic interplay of learner-related factors in diverse and evolving educational contexts.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.0 Overview

This chapter focuses on the methodological approach used in the study to gather information. The chapter discusses the research design used, target population, sample design and sampling method. It describes data collection instruments as well as the data analysis techniques that was used.

3.1. The Study Area

This study was carried out in Marigat sub county of Baringo County, Kenya. It is bordered by Baringo North, Baringo Central, Tiaty and Mogotio sub counties. It has an area of 11,075 kilometres square and an estimated population of 90,958 people (Kenya National Bureau of Statistics, 2019). It is a semi-arid area that lies 1067 metres above sea level within the latitude of 0.467 and longitude of 35.983. The Marigat sub-county is mainly populated by the Tugen community, particularly the Samor sub-group from the highlands, alongside the Ilchamus who reside in the northern lowland areas. Furthermore, Pokot communities, mainly herders, inhabit the area.

Public mixed day secondary schools in Marigat sub-county were selected because they consistently underperform in national mathematics examinations relative to county and national averages, yet the interplay of teaching quality, instructional resources, classroom organization, and leadership support in this rural, semi-arid context remains underexplored; by focusing on these schools pinpointed the most critical school-based factors affecting mathematics achievement and equip county education officers, school leaders, and policymakers with targeted, evidence-based strategies to improve instructional practice and learner outcomes in similar rural day-school settings.

3.2. Research Design

In this study, integrated mixed methods design that combines descriptive statistics, Pearson correlation, multiple regression, and thematic analysis of interview schedules was used. I begin by profiling each quantitative variable through measures of central tendency and variability, then use Pearson's (r) to identify significant linear associations. Building on these insights, regression models estimate the predictive power of key predictors while controlling for confounders, thereby moving from description to explanation and prediction in a coherent analytic sequence (Hirose, M., & Creswell, J. W. 2023).

Concurrently, I analysed qualitative data from semi-structured interview schedules using Braun and Clarke's six-step thematic analysis approach. This involves familiarization with transcripts, generating initial codes, searching for themes, reviewing and defining themes, and producing a thematic report. Triangulating thematic findings with quantitative results enriches interpretation, enhances validity through methodological complementarity, and uncovers nuanced insights that neither method could reveal alone (Braun & Clarke, 2022).

3.3 Target Population

According to Hancock, Algozzine, and Lim, (2021), the target population is the augmentation of entities that hold the information being sought by the researcher. This study targeted a population comprising of school principal, students, and mathematics teachers within the public schools in Marigat Sub- County, because they relate to the trend in mathematics performance in their schools and being in a location to get the required data.

In Marigat Sub- County, there are 26 public secondary schools out of which 18 are public mixed day secondary schools while 8 are boarding schools comprising of 26 principals, 104 mathematics teachers and 783 form four learners. The study targeted 18 public mixed day secondary schools comprising of 18 principals, 44 mathematics teachers and 554 form four students as shown in table 3.1.

Table 3.1: Target Population

Category	Target Population
School principals	18
Mathematics teachers	44
Form four learners	554
Total	616

Source; Baringo County Educational Office

Table 3.1 shows a target population of this study as 616.

3.4. Sampling Design and Size

Sampling involves selecting some element in a population to draw conclusion about the entire population. According to Malmqvist et al. (2019), the sample should be small enough to be economical in terms of expenses on time, money, data analysis, and ensure representation of all in the population proportionately. A sample to participate in this study was then arrived at using the sampling frame presented in table 3.2.

Table 3.2: Sampling frame

Sampling Procedure	Population	Sample
Stratified sampling of mixed day schools	26	18
Purposive sampling of schools with Form four	18	12
Census of principals to participate	12	12
Simple random sampling of teachers to participate	44	24
Stratified random sampling of form four students	554	120
Sample Size		156

Source: Author 2024

Stratified sampling was used to select 18 public mixed day secondary schools in Marigat Sub County. Purposive sampling was then used to select all 12 public mixed day schools that have been presenting KCSE candidates from Year 2019-2023. This criterion is significant as it ensures that the selected schools have relevant experience and data on the KCSE examinations, making the insights gained from these institutions more pertinent to the research question. According to Bailey and William (2018), purposive sampling is where the researcher makes his or her judgment on deciding on individuals to take part in study from the population. Census of the 12 School principals was used in the study and Simple random sampling was then used to select 2 mathematics teachers and while stratified random sampling was used to select 10 form four learners (5 girls and 5 boys) from each of the 12 mixed day public secondary school. According to Campbell et al. (2020), when collecting data about institutions, a sample size of 10 participants per institution would amass data very quickly. The sampling strategy implied that a total of 24 teachers participated as well as 120 students.

The total sample of principals (12), teachers (24) and students (120) are 156 respondents hence the sample of this study.

Pandey and Pandey (2021) noted that a researcher can use elements of a population with the required information in line with the objective of the study. The principal was purposively selected because they have the responsibility of implementing curriculum and administration duties, mathematics teachers have the role of implementing the mathematics curriculum and are versed with information on factors within the school that influence academic achievement. Four learners were selected because they have stayed longer in school and, hence having experience.

3.5. Research Instruments

The instruments for gathering data for purpose of this study included questionnaires, interviews, and document analysis.

3.5.1 Questionnaires

Krosnick (2018) defined a questionnaire as a data research instrument with questions aimed at gathering data from respondents. This current study uses self-administered questionnaires as a primary data collection tool to capture perceptions and experiences related to learning environment factors, curriculum implementation practices, teacher-related variables, and learner characteristics. The instrument is distributed to students, teachers, and administrators, with sections aligned to each construct in the conceptual framework and demographic items on age, gender, and work experience to capture intervening variables. Question items combine Likert-scale statements measuring resource availability, instructional effectiveness, teacher–student rapport, and learner motivation. Responses are coded numerically for quantitative analysis ensuring the tool

both quantifies trends and uncovers nuanced insights into the factors shaping KCSE outcomes.

Using questionnaires is justified by their ability to standardize data collection across a diverse population, offering scalability and efficiency in reaching a large sample within limited time and resources. The structured format enhances reliability through consistent item administration, and pilot testing coupled with expert validation ensures clarity and construct validity. Anonymity in responses encourages honest feedback on sensitive issues like teacher-student relationships or perceived curriculum gaps. By generating statistical indicators, questionnaires facilitate robust triangulation with document analysis and interviews, yielding a comprehensive, evidence-based understanding of how independent and intervening variables converge to influence learners' academic achievement in KCSE.

3.5.2 Interview Schedule

Bazen et al. (2021) defined an interview as a guide which provide for individuals to interact whereby one is an interviewer while the other one is an interviewee. In my research, I chose an interview schedule as the primary data collection tool. This decision is based on the tool's ability to gather in-depth, detailed, and meaningful information that aligns with the objectives of my study. Compared to other methods, the interview schedule allows for more flexible, personal interaction with participants, which helps to explore complex issues in a deeper and more nuanced way. The choice is justified by its strength in achieving both validity and reliability, as well as its practical benefits in qualitative research contexts.

Firstly, the interview schedule offers a high degree of validity, especially content and construct validity. The questions in my schedule were developed based on a thorough

review of relevant literature, theories, and previous studies related to my topic. This ensures that the questions are directly tied to the key concepts I aim to investigate. Because interviews allow for follow-up questions and clarification, participants can provide rich, detailed responses, reduce the risk of misinterpretation and enhancing the accuracy and depth of the data collected.

Additionally, the use of an interview schedule contributes to reliability, particularly interview consistency. By preparing a structured or semi-structured set of questions in advance, I can ensure that each participant is asked the same core questions, which allows for better comparison and analysis of responses. At the same time, the flexibility of an interview allows me to probe for more information where needed, without compromising the overall structure. This balance between consistency and flexibility supports both dependability and trustworthiness in the research process.

From a practical standpoint, an interview schedule helps me maintain focus during the interview sessions while also building rapport with participants. It reduces the chance of omitting important questions and helps manage time effectively during the interview process. Furthermore, face-to-face or virtual interviews create opportunities for observing non-verbal cues, which can add valuable context to the verbal responses.

The interview schedule (Appendix IV) was used to collect information from principal such as number of teachers, availability of resources, culture of mathematics and role of mathematics and challenges facing the subject in the school.

3.5.3 Document Analysis

This study employs document analysis as a systematic, non-reactive method for gathering rich contextual data on the factors influencing KCSE performance. By examining school policy documents, teacher qualification records, curriculum guides,

lesson plans, learner portfolios, and KCSE performance reports, the research uncovers how learning environment factors, curriculum implementation, teacher qualifications and skills, and learner characteristics are recorded and enacted in practice. This approach allows for a comprehensive view of both formal policies and everyday practices without interrupting the natural educational setting.

The analysis process begins with the careful selection and authentication of relevant materials, ensuring each document's source, date, and authorship are verified to maintain reliability. Researchers then apply a thematic coding framework aligned with the study's conceptual model, extracting passages that illustrate environment variables, curriculum strategies, teacher–student interactions, and intervening factors such as age, gender, and work experience. Finally, insights drawn from documents are triangulated with survey and interview data, enriching the study with historical and institutional evidence and offering a multifaceted understanding of what drives learners' academic achievement in KCSE.

3.6. Piloting

Malmqvist et al. (2019) defined piloting as a preliminary study conducted on small scale to ascertain the effectiveness of the research instrument. Pandey and Pandey (2021) assert that a pre-test sample should be between 1% and 10% depending on the sample size. The test was conducted to evaluate the validity and reliability of questionnaire. Two (2) schools from the neighbouring Baringo Central was undertaken for pilot study. This study assisted in reviewing unclear questions in questionnaire for reframing.

3.6.1 Validity of Instruments

Validity is a measure of the degree at which a research tool can measure what is intended to measure (Elangovan, & Sundaravel, 2021). After conducting the pilot study, the validity of the research instrument was evaluated to ensure it effectively measures the intended constructs. The content validity of the instrument was assessed by a panel of experts who reviewed each item for relevance and clarity. Using the Content Validity Index (CVI), a score of 0.861 was achieved, indicating a satisfactory level of agreement among experts regarding the appropriateness of the items. This suggests that the instrument covers the essential elements of the construct and is appropriately designed for the target population.

In addition to content validity, face validity was also considered by gathering feedback from participants during the pilot phase. Respondents found the items to be clear and understandable, confirming that the instrument appears to measure what it intends to at face value. Preliminary analysis supported construct validity, with responses aligning well with theoretical expectations. Based on these findings, minor revisions were made to enhance clarity and consistency, resulting in an instrument that is both valid and reliable for use in the main study.

3.6.2 Reliability of Instruments

Reliability of research tool is the accuracy of the results obtained by the tool (Chetwynd, 2022). The pilot administration of the questionnaire to respondents yielded a Cronbach's alpha of 0.861, indicating excellent internal consistency among items designed to measure learning environment factors, curriculum implementation practices, teacher-related variables, and learner characteristics. Test re-test methods for teacher's questionnaire had a reliability coefficient of 0.791 while the questionnaire for students had a reliability coefficient of 0.812. These reliability coefficients surpassed the

commonly accepted threshold of 0.70, confirming that the instrument's items coherently capture the intended constructs and produce stable scores across different participants (Izah, Sylva, & Hait, 2023).

These results demonstrate that the survey is ready for large-scale deployment, providing a dependable measurement foundation for assessing the drivers of KCSE academic achievement. High inter-item homogeneity not only supports the theoretical structure of the conceptual framework but also ensures that subsequent statistical analyses and inferences about the relationships among variables rest on a robust and reliable instrument.

3.7. Data Collection Procedures

An introduction letter from Bomet University was obtained before data collection. Similarly, research permit was obtained from the National Commission for Science, Technology, and Innovation (NACOSTI), a constitutional institution mandated by Kenyan government to oversee all educational issues. Permission for research was further obtained from county and Sub-County Director of education. After which the researcher visited sampled schools and sought permission from Principal. Questionnaire was issued to mathematics teacher and form-four students, and the researcher conducted interview with the principal. The researcher assured the respondents that the data they provided was to be treated with high level of confidentiality and used only for the study.

3.8. Data Analysis Techniques

3.8.1. Quantitative Data Analysis

Upon collecting data from the field, data was placed into systemic analysis process. Data cleaning and editing was the first step in analysing process. Data cleaning involved the detection and correction of data anomalies or discrepancies which could arise from

incorrect, incomplete, or irrelevant data. Data editing involved reviewing and adjusting data collected to control the value of data received without altering it. Data editing helped in identifying respondents' errors such as spelling mistake and unanswered questions.

Data was then coded and entered to a computer for statistical analysis, where Statistical Package for Social Science (SPSS) software was utilized for analysis. Descriptive and inferential data analysis technique was used to analyse the collected data. Descriptive statistics involves the process of Describing, showing, and summarizing the basic feature of a dataset for a researcher to understand data better. It involves the use of frequency distribution measure of central tendency and dispersion. (Wooditch et al., 2021).

Frequency Distribution was used to summarize the frequency of every possible value of a variable in number or percentage then presented using graphs and tables (Homa et al., 2023). Measure of central tendency was utilized to estimate the centre or average of a data set which will include mean, median and mode. Standard deviation was used to show the amount of variation of the responses given by the respondents. The Pearson correlation coefficient was used to measure strength and direction of association among variables while the multiple linear regression method was model the effect of independent variable on Mathematics achievement. The following regression equation guided the analysis:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + e$$

Where Y= learners' achievement in mathematics, X_1 = learning environmental factors, X_2 = curriculum implementation factors, X_3 = teacher-related factors, X_4 = learner-related factors, B_0 = constant, B_1 = Beta coefficient for learning environmental factors, B_2 = Beta

coefficient for curriculum implementation factors, B_3 = Beta coefficient for teacher-related factors, B_4 = Beta coefficient for learner-related factors, e = error term

3.8.2. Qualitative Data Analysis

The analysis began by transcribing all interviews verbatim and importing them into NVivo. An initial open-coding phase identified text segments tied to the conceptual framework's constructs from, learning environment conditions, curriculum implementation practices, teacher-related dynamics, learner characteristics, and intervening variables (age, gender, work experience). Through axial coding, related codes were clustered into preliminary categories, and a detailed codebook was developed to ensure consistency in definitions and exemplar quotes across the research team.

Selective coding then distilled these categories into overarching themes and subthemes emerging from principals' perspectives. Key themes included leadership in resource allocation, strategies for enhancing instructional quality, support mechanisms for teacher professional development, and approaches to addressing learner diversity and motivation. Credibility was bolstered through member checking—sharing synthesized themes with a subset of principals for confirmation—and peer debriefing sessions. Triangulation with questionnaire and document analysis further reinforced the trustworthiness of the qualitative findings.

3.9. Ethical Considerations

Ethics is a standard of conduct that differentiates acceptable behaviour in research from the unacceptable ones (Weinbaum et al., 2019). Researchers are generally barred from shaming, causing pain and enforcing disastrous consequences on the respondents. Before data collection, the researcher explained to the respondents the benefits of

participating in the study by making a free and independent decision while responding to questions. The researcher further ensured high level of anonymity to safeguard the privacy of the respondent, by telling them not to indicate their personal details on the questionnaire.

Further, the researcher at all-time acknowledged the work from other scholars whenever it utilized in the study to appreciate.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS, INTERPRETATION AND DISCUSSIONS

4.0 Overview

This chapter presents and discusses the results of the research into effect of school-based factors on learners' KCSE achievement in mathematics in public mixed day secondary schools in Marigat sub county, Baringo County. The chapter first outlines the response rate and the profile of the respondents. It then proceeds to present the results on the academic achievement in mathematics within the study area. The link between academic achievements and school-based factors namely learning environment factors, curriculum implementation factors, teachers-related factors, and learner-related factors are also analysed and discussed in detail. The discussion focuses on the implications of the findings for educational policy and practice.

4.1 Response Rate

All the 156 individuals who were selected agreed to participate and completed the study by either completing a questionnaire or engaging in the interviews. Consequently, the response rate was 100%. A survey response rate of 100% can be highly beneficial in ensuring that the data collected is both reliable and valid. According to De leew (2018), a high response rate can help minimize non-response bias and increase the representativeness of the sample, thereby increasing the generalizability of the findings. This is particularly important in ensuring that the results are applicable to the wider population of learners within Marigat Sub County, Baringo County. Furthermore, a high response rate can also improve the overall quality of the data, as it ensures that there is fewer missing data and a higher degree of completeness (De leew, 2018).

4.2 Profile of the Respondents

Analysing the demographic profile of respondents is an essential step in ensuring that the study's findings are representative of the wider population. According to Hirt et al. (2020), demographic data can provide crucial insights into the characteristics of the study population and help to identify potential sources of bias. The authors further suggest that analysing demographic data can also aid in the interpretation of study findings and the development of targeted interventions to improve outcomes for specific groups. The profile of students who responded to the study was analysed in terms of gender and age. Table 4.1 presents the outcomes of the analysis.

Table 4.1: Demographic Profile of the Students' Sample

Demographic Trait	Categories	Frequency	Percent
Gender	Male	60	50.0
	Female	60	50.0
Age	Below 16 years	12	10.0
	16- 20 years	104	86.7
	Above 20 years	4	3.3

Source: Field Data (2024)

Table 4.1 shows that the sample was evenly distributed in terms of gender with male and female students' constituting 50% of the sample each. A 50/50 gender distribution indicates a balanced representation of both males and females. According to Pavlova and Silbereisen (2019), gender is an important demographic variable that can moderate the effects of other variables in research studies. The authors suggest that an even gender distribution can increase the generalizability of study findings and reduce potential biases in sample selection.

In terms of age, most of the students (86.7%) were in the 16-20 years age brackets. This age distribution is congruent with the age distribution in the general population of form four students in the country. According to a report by the Ministry of Education in Kenya, the average age of form four students is around 17-19 years old (Ministry of Education, 2019). Students usually start primary school at the age of six or seven, finish it at the age of 13 or 14, and then start secondary school. Secondary school is typically four years, with form four being the final year of secondary school. The profile of teachers' sample was also analysed in terms of gender, age, number of years they had worked in their respective schools, and number of years they had taught mathematics. Table 4.2 presents the findings.

Table 4.2: Demographic Profile of the Teachers' Sample

Demographic Trait	Categories	Frequency	Percent
Gender	Male	18	75.0
	Female	6	25.0
Age	Below 40 years	16	66.7
	41-50 years	7	29.2
	Over 50 years	1	4.1
Number of years taught in the sample school	1-5 years	13	54.2
	6-10 years	8	33.3
	Over 10 years	3	12.5
Number of years teaching mathematics	Less than 5 years	6	25.0
	6- 10 years	11	45.8
	11-15 years	4	16.7
	Over 16 years	3	12.5

Source: Field Data (2024)

Table 4.2 illustrates that three-quarters of the sampled teachers 18 (75%) were male while the remaining 6 (25%) were female. These findings suggest that there are more

male than female mathematics teachers in Marigat Sub-County. The findings are congruent with the study by Mozahem (2021), who also found that male teachers accounted for 77.42% of the population of mathematics teachers on public secondary schools in Muhoroni Sub-County. This implies that the gender distribution in the teacher sample might reflect the gender distribution in the general population of mathematics teachers in public secondary schools in Kenya.

In terms of age, 16 (66.7%) of the teachers were below the age of 40 years, 7 (29%) were between 41 and 50 years, and 1 (4.2%) were above 50 years. These findings imply that most mathematics teachers in Marigat Sub-County are below 40 years of age. These findings are consistent with the study by Wanjiru (2019), who established that 80% of mathematics teachers in public secondary schools in Kilifi Sub-County were below the age of 40 years. This implies that the age composition in the study sample might reflect the age demography of the general population of mathematics teachers in Kenya.

Regarding the number of years worked in the sampled schools, 13 (54.2%) had worked for 1-5 years, 8 (33.3%) had worked or 6-10 years, and 3 (12.5%) had worked for over 10 years. These statistics imply that most of the mathematics teachers in Marigat remain in one school for five years or less. The findings suggest a high turnover rate of mathematics teachers in the schools. High teacher turnover and short teacher stay in a school is associated with disruption in instructional continuity, reduced teacher-student rapport, and limited opportunities for teacher professional development (Sahadewo, 2019).

On the other hand, 11 (45.8%) of the respondents had taught mathematics for 6-10 years, 6 (25%) had taught for less than 5 years, 4 (16.7%) had taught for 11-15 years, and 3 (12.5%) had taught for over 16 years. The statistics implies that the largest

segment of mathematics teachers in Marigat Sub-County have a teaching experience of 6-10 years. This is not congruent with Wanjiru (2019), who found that the largest segment of mathematics teachers (47%) in Kilifi Sub-County had teaching experiences of 11-15 years. This implies the experience of mathematics schoolteachers in public secondary school vary from one sub-county to another. The fact that the experience of teachers in the study sample is shorter than that of Wanjiru's sample supports the position that there is high turnover of mathematics teachers in Marigat Sub-County.

4.3 Academic Achievement in Mathematics

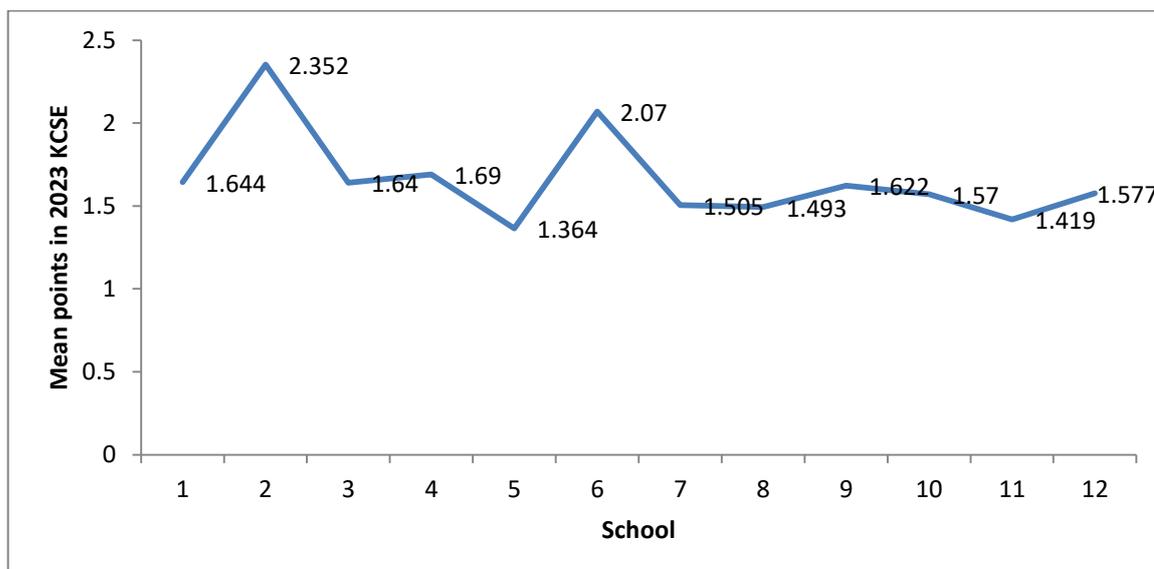
Academic achievement in mathematics was the dependent variable of the study. This variable was measured using the mean grades obtained by the sampled schools in the KCSE in the year 2023. The KNEC grades subject scores in the KCSE examination on a twelve-point scale, with 12 being the highest point and 1 being the lowest. The questionnaire prompted the 24 teachers to indicate the mathematics average points for their respective schools in the 2023 KCSE examinations. The researcher then computed the aggregate mean points for the scores given by each teacher. Table 4.3 summarizes this information.

Table 4.3: Academic Achievement in Mathematics in the Sampled Schools

Statistic		Value
N	Valid	12
	Missing	0
Mean		1.662
Minimum		1.364
Maximum		2.352

Source: Field Data (2024)

Table 4.3 shows that the sampled school had aggregate mean points of 1.662 in mathematics in 2023. This implies that on average, most students who did their KCSE in the sampled school in 2023 scored a D- in mathematics. The points are lower than the average points for Baringo County for the last five years, which stood at 2.97. Table 4.3 further reveals that the best performing school within the sample had aggregate mean points of 2.352 while the worst performing school had an aggregate mean of 1.364 in the 2023 KCSE examinations. The overarching conclusion drawn from the data is one indicating a concerning level of mathematical achievement within the context of the sampled school particularly when compared with regional performance. The lower performance levels in Marigat Sub-County's mixed-day public secondary schools signal a systemic issue that requires attention. This variance points towards existence of school factors that distinguishes the performance of one school from the other. Figure 4.1 presents a breakdown of the achievement of each of the 12 sampled schools in 2023 KCSE examination.



Source: Field Data (2024)

Figure 4.1: Trends in the Mathematics Achievement across the Sampled Schools

Figure 4.1 shows that all the mathematics mean points of most of the schools fell between 1 and 2, suggesting that most students scored D- and E grades. In fact, only school 2 had mean point that was greater than 2 in the 2023 KCSE. These findings are congruent with a 2019 report by the Nairobi County Government, which highlighted low performance in mathematics in public day secondary schools. The report stated that most students were scoring below average in mathematics in their KCSE exams. The findings are also congruent with the study by Obuya, M.A (2019), who observed that the mean score for mathematics declined from 4.32 in 2010 to 3.96 in 2014 in public secondary schools in Kenya. The findings are also reinforced by qualitative data collected through interviews with the principals.

All the 12 principals acknowledged that the achievement of their schools in mathematics in the past few years had been below par. Interviewee P3 (54 years old) disclosed that “for the last five years, the performance has not been good and in a declining trend.” Other participants describe mathematics performance in their school as “low,” “below average,” “poor,” and “declining.” According to Interviewee P7 (51 years old), “the mathematics is one of the poorly performed subjects in the school.”

4.4. Learning Environmental Factors and Academic Achievement in Mathematics

The study sought to establish the effect of learning environmental factors on mathematics achievement in KCSE among learners in public mixed day secondary schools in Marigat sub-county. The findings are presented in this section.

4.4.1 Students’ and teachers’ responses on learning environment.

The questionnaires contained a list of five items that students and teachers’ rate on five-point scale. Table 4.5 summarizes the results.

Table 4.5: Teachers' and Students views on Learning Environment Factors

S/N	Statement	Respondent	5	4	3	2	1	Mean	SD
1	There are enough teaching and learning facilities in the school such as classroom, library which enhance learning.	Teacher	16.7	29.2	20.8	20.8	12.5	3.17	1.308
		Student	36.7	25.8	23.3	8.3	5.8	3.79	1.194
2	The harsh climatic conditions such as high temperature interrupt afternoon lessons.	Teacher	29.2	37.5	25.0	0.0	8.3	3.79	1.141
		Student	51.7	17.5	16.7	5.0	9.2	2.02	1.312
3	My school is safe and conducive for learning and teaching	Teacher	41.7	33.3	20.8	4.2	0.0	4.13	0.900
		Student	50.0	18.3	20.8	7.5	3.3	4.04	1.148
4	In my school, student and teachers trust one another and work towards common interest.	Teacher	16.7	20.8	58.3	0.0	4.2	3.46	0.932
		Student	33.3	20.0	14.2	9.2	23.3	3.31	1.576
5	The school has a culture that encourages diversity and celebrates achievement, which has improved performance in mathematics	Teacher	12.5	20.8	16.7	25.0	25.0	2.71	1.398
		Student	20.8	15.0	18.3	14.2	31.7	2.79	1.539

Source: Field Data (2024)

Table 4.5 shows that 4, (16.7%) of the sampled teachers agreed strongly, 7(29.2%) agreed, 5(20.8%) agreed a little, 5(20.8%) disagreed, and 3(12.5%) strongly disagreed that there are enough teaching and learning facilities in the school such as classroom,

library which enhance learning. Similarly, 44(36.7%) of sampled students agreed strongly, 31(25.8%) agreed, 28(23.3%) agreed a little, 10(8.3%) disagreed, and 7(5.8%) strongly disagreed with this claim. The findings show a consistency between the views of teachers and students regarding teaching and learning facilities within the schools. These findings imply that most public co-educational schools in Marigat Sub-County have adequate teaching and learning facilities. The findings contradict the study by Simiyu, Burajmoh and Davidson (2021), who found that most public co-educational secondary schools lacked functional libraries, and many of the available ones were poorly resourced.

On the other hand, 7(29.2%) of the sampled teachers agreed strongly, 9(37.5%) agreed, 6(25.0%) agreed a little, and 2(8.3%) strongly disagreed with the claim that the harsh climatic conditions such as high temperature interrupt afternoon lessons. Students expressed almost similar views with 62(51.7%) agreeing strongly, 4(17.5%) agreeing, 4(16.7%) agreeing a little, 2(5.0%) disagreeing and 2(9.2%) disagreeing strongly with this statement. These statistics suggest that most of the public mixed day secondary schools in Marigat Sub-County experience harsh climatic conditions that interrupt afternoon lessons. These findings are congruent with a study by Red Cross (2018), which revealed that droughts were a major cause of school closures, particularly in regions where water is scarce. In some cases, schools were forced to close for several weeks or even months, causing students to fall behind and lose motivation.

Then again, 10(41.7%) of the sampled teachers agreed strongly, 8(33.3%) agreed, 5(20.8%) agreed a little, and 1(4.2%) disagreed that their school was safe and conducive for learning and teaching. Students' views were not far off because 12(50%) strongly agreed, 22(18.3%) agreed, 25(20.8%) agreed to a little extent, 9(7.5%) disagreed and 4(3.3%) disagreed strongly with the assertion that their schools were safe. These findings

suggest that insecurity is not a major hindrance to learning in most public mixed day secondary schools in Marigat Sub-County. The findings contradict a study by KNEC and TSC (2019), where it was reported that insecurity incidents, such as bandit attacks and cattle rustling, pose a significant threat to education in Baringo County. The inconsistency may be explained by the reason that the insecurity experienced in the larger Baringo County is not prevalent in Marigat. It is also probable that the security situation in Baringo has changed since the studies by KNEC and TSC were conducted in 2019.

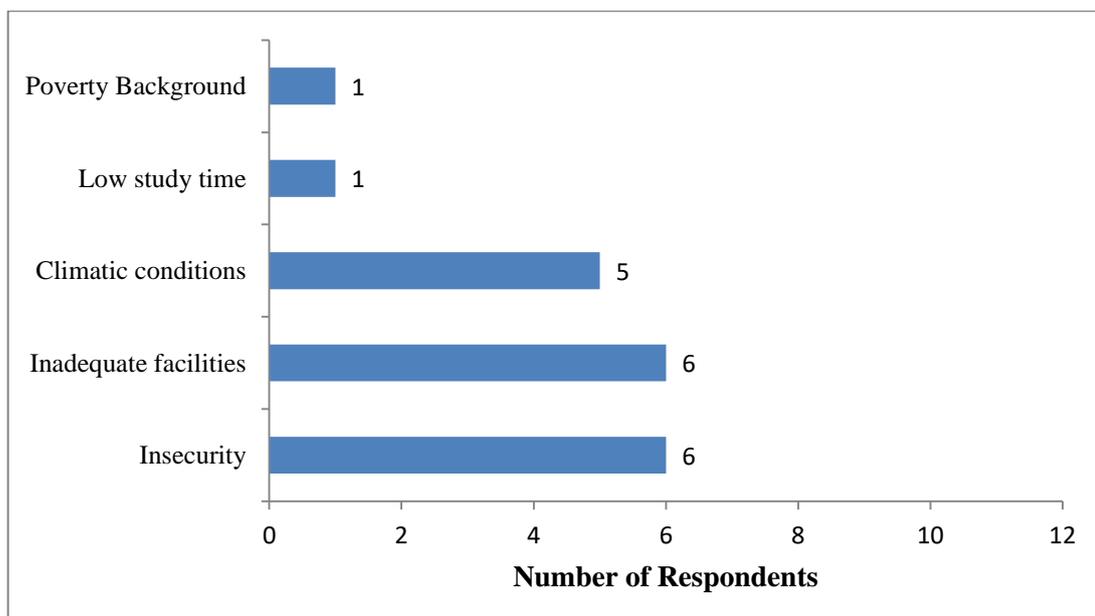
Moreover, 4 (16.7%) of the sampled teachers agreed strongly, 5 (20.8%) agreed, 14 (58.3%) agreed a little, and 10 (4.2%) disagreed strongly that in their school, students and teachers trust one another and work towards common interest. Similarly, 39 (33.3%) of sampled students agreed strongly, 24 (20.0%) agreed, 17 (14.2%) agreed a little, 11 (9.2%) disagreed, and 28 (23.3%) disagreed strongly with the statement that there is trust between teachers and students. This implies that there is trust between students and teachers in most public mixed day secondary schools in Marigat. These findings are not congruent with Kamau L. (2022), who found that there was a significant level of distrust between students and teachers in Kenyan secondary schools. The study revealed that students perceived teachers as unfair, biased, and not transparent in their dealings. There was also a general feeling among students that teachers did not act in their best interests. However, Paschal & Mkulu (2022) discovered that the level of trust between students and teachers varied significantly depending on teacher-student interactions and communication. This could explain why the findings of the current study differ with those of (Kamau L. 2022).

Lastly, 3 (12.5%) of the teachers agreed strongly, 5 (20.8%) agreed, 4 (16.7%) agreed a little, 6 (25.0%) disagreed, and another 6 (25%) strongly disagreed that their school had a

culture that encourages diversity and celebrates achievement, which has improved performance in mathematics. Similarly, 25 (20.8%) of the sampled students agreed strongly, 18 (15.0%) agreed, 22 (18.3%) agreed a little, 17 (14.2%) disagreed, and 38 (31.7%) strongly disagreed with the statement on culture. The total proportion of teachers and students who agreed with this statement was 1250% and 6454.1% respectively, which is an indication that close to half of the teachers and students did not agree. These statistics imply that there were major variations in the culture of the schools with about half of the schools exhibiting a culture that encourages diversity and celebrates achievement while the other half does not. Van Mollendoff (2022) also found that while some schools have successfully implemented this culture, others still struggle with creating a culture of diversity and achievement due to various factors.

4.4.2 Principals' Qualitative Reflections on learning environment

principals involved in the interviews believed that there is inadequate infrastructure in the schools and that insecurity is also a problem in Marigat. Six out of the twelve principals (50%) mentioned insecurity and inadequate facilities to be among the learning environment factors contributing to poor academic achievement in mathematics. Five out of the twelve principals (41.7%) reinforced the teachers' position that harsh climatic conditions particularly hot temperatures were hampering learning contributing to poor academic achievement in mathematics within the school. Figure 4.2 summarizes the themes that emerged during the interviewees with the principals.



Source: Field Data (2024)

Figure 4.2: Principals views on Learning Environment Factors affecting Mathematics Achievement

As Figure 4.2 illustrates, two other learning environment factors emerged from the interview data namely low study time and poverty background. Regarding low study time, Interview P6 (57 years old) described that “being a day school, contact time between students and teachers is low. Students do not benefit from evening and weekend preps lessons.” This excerpt shows that the respondents believe that the day status of their school was contributing to poor mathematics achievement by minimizing the time available for students to study.

On poverty background, Interviewee P7 (51 years old) explained that “majority students cannot afford mathematical equipment such as calculators and geometry sets due to the poor family background.” From this excerpt, the interviewee believed that most of the students in Marigat schools came from poor family background. Their poverty situation

limits their access to mathematics equipment leading to poor achievement in mathematics examinations.

4.4.3 Pearson Correlation of learning environment factors and Mathematics Achievement

The data collected from students using Likert scale was converted to continuous data to facilitate the use of Pearson correlation method. The conversion was done by adding up the scores for each respondent and dividing it by 5 to yield a continuous variable for everyone. The sum was divided by 5 because there was a total of 5 items in the scale. For instance, if respondent gave all the five items a rating of 5, cumulative teaching and learning resource score would be 5 (25/5). Item 2 was reverse coded because the statement was negatively worded such that the highest score (5) meant that the learning environment was poor. The reverse coding means that a score of 5 becomes 1, 4 becomes 2, 3 remains 3, 2 becomes 4, and 1 becomes 5. Student data was used instead of teachers' data because students had a larger sample size which reduces the variability in the estimates of population parameters (Wanjiru, 2019). The null hypothesis, H_{01} , stated as:

H_{01} : *Learning environmental factors have no statistically significant effect on academic achievement in mathematics in public mixed day secondary schools in Marigat sub-county.*

This hypothesis was tested inferentially using bivariate Pearson's correlation in order to determine the direction and strength of association between the two variables in question. Results were as presented in Table 4.6.

Table 4.6: Correlation between Learning Environment Factors and Mathematics Achievement

		Mathematics achievement
Learning environment factors	Pearson Correlation	.054
	Sig. (2-tailed)	.560
	N	120

$\alpha = .05$

Source: Field Data (2024)

As noted in Table 4.6, there is a weak positive association between learning environment factors and mathematics achievement [$r = .054$, $p = .560$ at $\alpha = .05$]. The relationship is weak because the correlation coefficient is closer to zero than 1. Since the coefficient is positive, it implies that better learning environment factors are likely to produce better academic achievement in mathematics and vice versa. However, the association between the two variables was deemed non-significant because the p-value associated with Pearson correlation was greater than 0.05, the set level of significance. All these inferential test results imply that there was no significant association between learning environment factors and mathematics achievement, which is in tandem with the assertion of the null hypothesis, H_0 . The null hypothesis was therefore accepted.

These findings are not congruent with Simuyu, Burajmoh & Davison (2021), who found that lack of resources such as functional library hampered learning by limiting students' ability to do independent research. Red Cross (2018) also found that harsh climatic condition hampered learning by forcing closure of some schools. Current findings imply that other variables besides learning environment are playing a more critical role in determining students' mathematics achievement. The educators and policymakers in Marigat may need to shift their focus from enhancing the learning environment to other factors that could impact mathematics achievement. Current findings may indicate a

need for further investigation into what other factors are contributing to or hindering students' mathematics performance in these schools. Researchers may need to explore other variables that could be affecting achievement, such as home environment, parental involvement, or access to learning resources.

4.5 Curriculum Implementation Factors and Academic Achievement in Mathematics

The study assessed implementation of curriculum to determine the effect of curriculum implementation factors on academic achievement in mathematics amongst learners in public mixed-day secondary schools in Marigat Sub-County. The results are presented in this section

4.5.1 students' and teachers' responses on curriculum implementation

The questionnaires comprised of a Likert scale with five items aimed at obtaining teachers and students views on curriculum implementation in their schools. Table 4.7 summarizes these views:

Table 4.7: Teachers' and Students views on Curriculum Implementation in the School

Statement	Respondent	5	4	3	2	1	Mean	SD
Teachers uses different teaching methods other than lecturing during mathematics lesson such as group discussion	Teacher	37.5	16.7	25.0	20.8	0.0	3.71	1.197
	Student	51.7	9.2	18.3	10.0	10.8	3.81	1.434
Weak students in mathematics are given special attention such as extra remedial	Teacher	4.2	25.0	29.2	12.5	29.2	2.63	1.279
	Student	12.5	10.0	7.5	13.3	56.7	2.08	1.476
Availability of teaching and instructional materials have a great potential of improving performance in mathematics	Teacher	70.8	12.5	12.5	4.2	0.0	4.50	.885
	Student	35.8	20.8	20.0	11.7	11.7	3.58	1.382
Teachers use teaching and learning aids during mathematics lesson	Teacher	20.8	29.2	37.5	12.5	0.0	3.58	.974
	Student	39.2	13.3	19.2	10.0	18.3	3.45	1.533
Students are regularly assessed by use of varied strategies to enhance performance	Teacher	25.0	29.2	16.7	29.2	0.0	3.50	1.18
	Student	35.8	14.2	12.5	16.7	20.8	3.27	1.588

Source: Field Data (2024)

Table 4.7 displays that 9(37.5%) of the sampled teachers agreed strongly,4(16.7%) agreed, 6(25.0%) agreed a little, and 5(20.8%) disagreed with the statement that teachers in their school they use different teaching methods other than lecturing during

mathematics lesson. Similarly, 62(51.7%) of the sampled students agreed strongly, 11 (9.2%) agreed, 22(18.3%) agreed a little, 12(10.0%) disagreed, and 13(10.8%) disagreed strongly with the claim. These statistics imply that mathematics teachers in most of the public mixed day secondary schools in Marigat use different teaching methods other than lecturing in mathematics lessons. The findings are consistent with the study by Njoroge and Chemengich (2019), who observed that Kenyan secondary schools were increasingly adopting the use of student-centred, interactive approaches such as problem-solving, inquiry-based learning, and cooperative learning in teaching mathematics.

Also, 14.2% of teachers strongly agreed, 6(25.0%) agreed, 7(29.2%) agreed a little, 3(12.5%) disagreed, and 7(29.2%) strongly disagreed that weak students in mathematics are given special attention in their schools. On the other hand, most of the students either disagreed (13.3) or disagreed strongly (56.7) with this claim. It is evident that the views of students were different from that of teachers on this matter. The divergence of views may imply a misunderstanding between the two groups. It is probable that teachers are not aware of the students' needs or the students' needs are not being adequately communicated to teachers. The divergence of view makes it difficult to make conclusive inference on this issue. It is important to investigate the underlying reasons for the divergence of views.

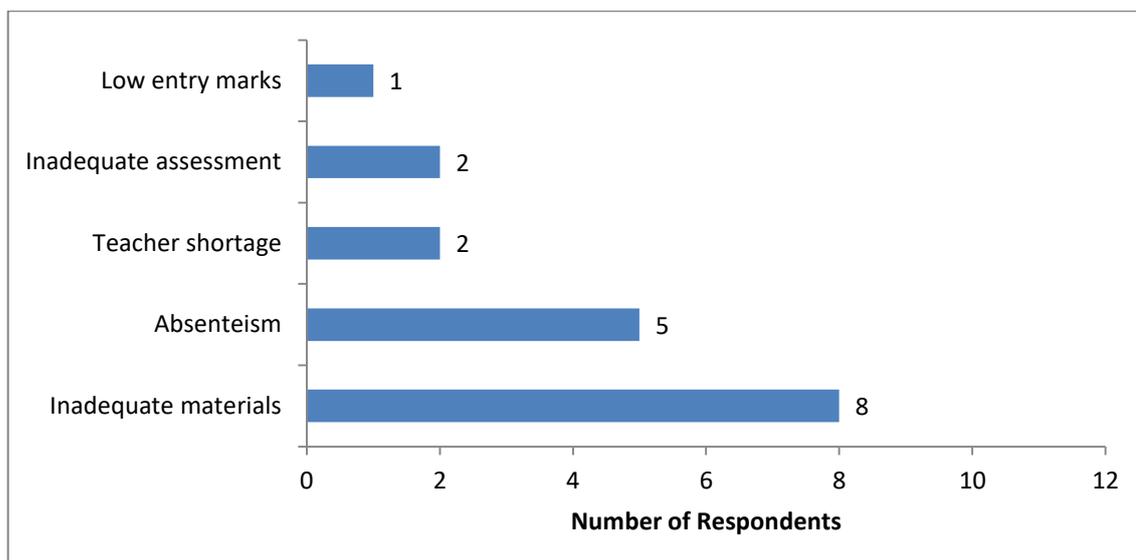
Moreover, 5(20.8%) of sampled teachers agreed strongly, 7(29.2%) agreed, 9(37.5%) agreed a little, and 3(12.5%) disagreed that teachers in their school use teaching and learning aids during mathematics lessons. Likewise, 47) 39.2% of the students agreed strongly, 16(13.3%) agreed, 2(319.2%) agreed a little, 12(10.0%) disagreed, and 22(18.3%) disagreed strongly with this assertion. These statistics implies that teachers in most of the public mixed day secondary schools in Marigat use teaching and learning

aids during mathematics lessons. These findings contradict the study by Kimeli et al. (2016), who found that many teachers in Baringo County face challenges in accessing and utilizing teaching aids effectively due to limited resources and inadequate training. The contradiction can be explained by the time difference between the studies, during which the situation might have changed.

Lastly, 12(25%) of the sampled teachers agreed strongly, 7(29.2%) agreed, 4(16.7%) agreed a little, and 7(29.2%) disagreed that students in their schools are regularly assessed by use of varied strategies to enhance performance. Equally, 43(35.8%) of the sampled students agreed strongly, 17 (14.2%) agreed, 15(12.5%) agreed a little, 20(16.7%) disagreed, and 25(20.8%) disagreed strongly with the same statement. These statistics denote that there is regular assessment of students in most of public mixed day secondary schools in Marigat using varied strategies to enhance performance. The findings are congruent with Dzinotyiwewi et al. (2020), who observed that secondary schools in Malawi were introducing peer assessment, self-assessment, and formative assessment methods to support student learning and achievement. These findings imply that the use of diverse assessment methods is on the rise in Sub-Saharan Africa.

4.5.2 Principals' Qualitative Reflections on curriculum implementation

The study also indulged the principals of the 12 schools to give their views on curriculum implementation factors that affected mathematics achievement in the schools. Figure 4.3 summarizes the themes that emerged during the interviews.



Source: Field Data (2024)

Figure 4.3: Principals views on Curriculum Implementation Factors affecting Mathematics Achievement

Figure 4.3 illustrates that from the principals' perspective, inadequate teaching and learning materials like textbooks and teaching aids is the curriculum implementation factor that affects mathematics achievement in most schools in Marigat. This factor was mentioned by 8 out of the 12 principals suggesting that it was evident in 66.7% of the schools. Absenteeism is also a major factor having been mentioned by 5 out of the 12 principals (41.7%). Interviewee P6 (57 years old) disclosed that "chronic absenteeism of some students hampers curriculum implementation." Other issues that emerged were teacher shortage, inadequate assessment of students' learning progress, and low student's entry marks.

4.5.3 Pearson Correlation of learning environment factors and Mathematics Achievement

The data collected from learners was converted to continuous data to facilitate the testing of the second hypothesis of the study. The conversion was also done by adding

up the scores for each respondent and dividing it by 5 to yield a continuous variable for everyone. The sum was divided 5 because there was a total of 5 items in the scale. The second null hypothesis, H_{02} , stated as:

H_{02} : *Curriculum implementation factors have no statistically significant effect on academic achievement in mathematics in public mixed day secondary schools in Marigat sub-county.*

This hypothesis was tested inferentially using bivariate Pearson's correlation to determine the direction and strength of association between the two variables in question. Results were as presented in Table 4.8.

Table 4.8: Correlation between Curriculum Implementation Factors and Mathematics Achievement

		Mathematics achievement
Curriculum implementation factors	Pearson Correlation	.551
	Sig. (2-tailed)	.000
	N	120

$\alpha = .05$

Source: Field Data (2024)

Results in Table 4.8 shows that there is a moderate positive association between curriculum implementation factors and academic achievement in mathematics [$r = .551$, $p = .000$ at $\alpha = .05$]. The relationship is moderate because the correlation coefficient is in-between zero and 1. The coefficient is also positive, which implies that better curriculum implementation factors are likely to generate better academic achievement in mathematics and vice versa. The association between the two variables was deemed significant because the p-value associated with Pearson correlation was less than 0.05,

the predefined level of significance. All these inferential test results imply that there was a significant association between curriculum implementation factors and mathematics achievement, which negates the assertion of the null hypothesis, H_{02} . The null hypothesis was not accepted.

These findings are congruent with the study by Ongori and Ogendi (2019), who found a significant positive correlation between curriculum implementation factors and mathematics achievement in selected rural secondary schools in Kenya ($r=0.63$, $p<0.01$). The study found that effective curriculum implementation, including adequate instructional time, teacher training, and availability of teaching resources, was associated with higher academic achievement in mathematics among students. Lugosi, E., and Uribe, G. (2022) also found that effective curriculum implementation, including teacher training, teaching resources, and the use of appropriate instructional strategies, was associated with higher mathematics performance among students ($r=0.76$, $p<0.01$).

4.6 Teacher Related Factors and Academic Achievement in Mathematics

The study to examine the effect of teacher-related factors on academic achievement in mathematics amongst learners in public mixed day secondary schools in Marigat sub-County. The findings are discussed in this section

4.6.1 Students' and teachers' responses on teacher related factors

The questionnaires for teachers and students also comprised a Likert scale with five items assessing the views of teachers and students regarding the teacher related factors within the sampled schools. Table 4.9 summarizes these views.

Table 4.9: Teachers and Students views on Teacher Related Factors

Statement	5	4	3	2	1	Mean	SD
Teachers							
Mathematics teacher to student ratio is low making it impossible for the teacher to interact with students.	20.8	45.8	12.5	16.7	4.2	4.21	.932
Mathematics teachers attend lesson on time and are committed to their work.	41.7	45.8	8.3	4.2	0.0	3.62	1.135
Teaching mathematics is tiresome and boring.	0.0	0.0	29.2	33.3	37.5	1.92	.830
Math's teachers are rewarded whenever there is improvement in mathematics	4.2	12.5	4.2	41.7	37.5	2.04	1.16
Mathematics teachers have adequate time to prepare lesson plan.	8.3	20.8	20.8	41.7	8.3	2.79	1.141
Students							
There is enough mathematics teacher in the school who always come for lessons	35.0	11.7	12.5	12.5	28.3	3.12	1.668
Teachers use teaching and learning aids during mathematics lesson.	37.5	21.7	20.0	7.5	13.3	3.63	1.397
Mathematics teachers have made me feel I could pass well in mathematics.	52.5	15.8	10.0	4.2	17.5	3.82	1.534
Teachers motivate us whenever we perform well in mathematics.	50.8	17.5	7.5	5.8	18.3	3.77	1.560
Teachers always give us assignment, and they mark our work as well as doing correction for us.	55.8	10.8	7.5	7.5	18.3	3.78	1.599

Source: Field Data (2024)

Table 4.9 illustrates that 5(20.8%) of the sampled teachers agreed strongly, 11(45.8%) agreed, and 3(12.5%) agreed a little with the assertion that mathematics teacher to student ratio in their school is low making it impossible for teachers to interact with students. On the contrary, most of the sampled students agreed strongly 42 (35.0%), agreed 14(11.7%), or agreed a little 26(21.5%) with the statement that there are enough mathematics teachers in the school who always come for lessons. There is difference in

opinion between teachers and students regarding the adequacy of mathematics teachers' staffing. This divergence may be attributed to inadequate understanding of workload experienced by mathematics teachers on the part of the students.

Table 4.9 also show that 10(41.7%) of the teachers agreed strongly, 11 (45.8%) agreed, 2 (8.3) agreed a little, and 1 (4.2%) disagreed that mathematics teachers attend lesson on time and are committed to their work. These findings imply that from the perspective of teachers, lesson attendance and commitment by mathematics teachers is high in over 80% of the public mixed day secondary schools in Marigat. The findings are congruent with study by Kiboi and Odongo (2019), where 82.7% of the teachers reported high lesson attendance rates, 79.9% reported being always punctual, and 57.5% reported being dedicated to their work. These findings suggest that lesson attendance, punctuality, and commitment by mathematics teachers are not major issues of concern in Marigat.

On a different note, 9(37.5%) of the teachers disagreed strongly and another 8(33.3%) disagreed while 7 (29.2%) agree a little with assertion that teaching mathematics is tiresome and boring. These statistics imply that in most of the public mixed day secondary schools in Marigat, teachers have a positive attitude towards teaching mathematics. However, most of the sampled teachers either disagreed 10(41.7%) or disagreed strongly 9(37.5%) with the claim that mathematics' teachers are rewarded whenever there is improvement in mathematics. This implies that most schools in Marigat do not reward their teachers whenever there is an improvement in students' performance. The findings are consistent with the study by Karanja et al. (2020), where 72.8% of the teachers reported not having received any reward for improved performance in the 12 months period preceding the study.

About 2 (8.3%) of the teachers agreed strongly, 5(20.8%) agreed, 5(20.8%) agreed a little, 10(41.7%) disagreed, and 2(8.3%) disagreed strongly with the assertion that teachers in their school have adequate time to prepare lesson plans. These results show that teachers' opinion on this issue was sharply divided. Half of the teachers agreed with this claim with other 50% disagreeing or disagreeing strongly. According to Makarova and Herzog (2019), difference in teachers' perceptions regarding the adequacy of time may be attributed to the experience and efficiency of individual teachers and personal time management skills. It could also be due to differences in the teachers' familiarity of mathematics content and curriculum, differences in the teachers' workload and responsibilities not related to lesson planning, and difference in access to support and resources (Makarova et al, 2019). Teachers who feel they have adequate time are likely to be more motivated and engaged in their work, leading to better lesson planning and delivery. Conversely, teachers who feel they do not have sufficient time are likely to experience stress and burnout, which can negatively impact their teaching performance and the quality of education provided to students.

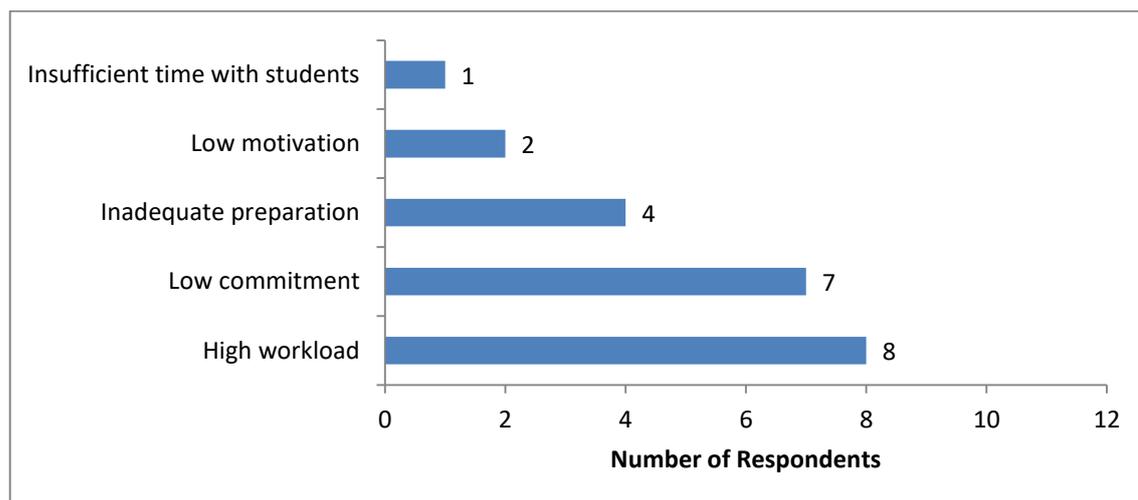
In addition, 63(52.5%) of the sampled students agreed strongly, 19 (15.8%) agreed, and 12(10.0%) agreed a little that their mathematics teachers had made them feel they could pass well in mathematics. Similarly, 61(50.8%) of the students agreed strongly, 21 (17.5%) agreed, and 9 (7.5%) agreed a little that their teacher motivate them whenever they perform well in mathematics. The findings imply that teachers in most public mixed secondary schools in Marigat motivate and inspire their students to excel in mathematics. The findings are congruent with Sri, P. M., & Perumal, R. B. V. (2024) who found that teachers in public secondary schools were proactive in building positive relationships with students, creating a supportive learning environment, and providing opportunity for students to engage with mathematics in meaningful ways. According to

a study by Zhu, Y., & Kaiser, G. (2022), teacher efficacy and their ability to create positive classroom environments can enhance student motivation, engagement, and achievement in mathematics.

Lastly, 67(55.8%) of the students agreed strongly, 13 (10.8%) agreed, and 9(7.5%) agreed a little with the claim that teachers always give them assignments, mark their work, and do corrections with them. This implies that teachers in most of the public mixed day secondary schools in Marigat give students assignment and take their time to mark and provide feedback to students despite their workload.

4.6.2 Principals' Qualitative Reflections on teacher related factors

The principals were also asked to give their view on teacher related factors that affect mathematics achievement in the schools during the interview. Figure 4.4 summarizes the themes that emerged from this session.



Source: Field Data (2024)

Figure 4.4: Principals' views on Teacher Related Factors affecting Mathematics Achievement

Figure 4.4 illustrates that high workload was the most recurring theme having been mentioned by eight out of the 12 principals (66.7%). This implies that over two-thirds of the principals believed that high workload among the teachers was affecting learners' achievement in mathematics. The principals were categorical that the high workload was due to the high students-teacher ratio especially after introduction of the policy of 100% transition from primary to secondary schools.

High teacher workload can have negative effects on students' achievement in mathematics. When teachers are overwhelmed with a heavy workload, they may not have enough time and energy to adequately plan and deliver high-quality instruction, provide timely feedback, and address individual student needs. The study by McCarthy et al. (2019) found that teachers who reported high levels of workload were less likely to provide differentiated instruction, individualized support, and effective feedback, which in turn had a detrimental effect on students' mathematics achievement.

Another theme that was frequently mentioned was lack of commitment, with 7 principals accounting for 58.3% of the sampled principals citing this is a major factor affecting performance. Lack of commitment among mathematics teachers broadly means that they are not fully dedicated or invested in their roles as educators of mathematics. This lack of commitment can manifest itself in different ways, such as not putting in enough effort to create engaging and effective lesson plans, not being willing to help students who are struggling with the subject, or not being open to learning and adopting new, innovative teaching methodologies or technologies (McCarthy et al., 2019). A lack of commitment among mathematics teachers can lead to negative outcomes for students, such as lower levels of engagement and motivation, decreased academic achievement, and a lack of encouragement or support for pursuing math-related fields.

Four principals accounting for one-third of the sampled principals advanced that inadequate preparation on the part of teachers was also to blame for low mathematics achievements in their schools. Inadequate preparation may imply that teachers may not have sufficient knowledge, skills, and abilities to provide high-quality instruction to their students. According to Anthony and Walshaw (2023), teachers who are not adequately prepared to teach mathematics may struggle to effectively convey important concepts and skills, which can lead to low levels of student engagement and poor academic outcomes.

4.6.3 Pearson Correlation of teacher related factors and Mathematics Achievement

To test the third null hypotheses, the Likert scale data on teacher-related factors was transformed to continuous data. The transformed data was then correlated with aggregate mathematics scores of the schools for the last five years. The null hypothesis, H_{03} , stated as:

H_{03} : *Teacher related factors have no statistically significant effect on academic achievement in mathematics in public mixed day secondary schools in Marigat sub-county.*

This hypothesis was tested inferentially using bivariate Pearson's correlation in order to determine the direction and strength of association between the two variables in question. Results were as presented in Table 4.10.

Table 4.10: Correlation between Teacher Related Factors and Mathematics Achievement

		Achievement composite score
Teacher related factors	Pearson Correlation	.308**
	Sig. (2-tailed)	.001
	N	120

$\alpha = .05$

Source: Field Data (2024)

Results in Table 4.10 shows that there is a moderate positive association between curriculum implementation factors and academic achievement in mathematics [$r = .308$, $p = .000$ at $\alpha = .05$]. The relationship is moderate because the correlation coefficient falls between 0.3 and 0.7. The coefficient is also positive, which implies that better teacher related factors are likely to produce better academic achievement in mathematics and vice versa. The association between the two variables was deemed significant because the p-value associated with Pearson correlation was less than 0.05, the prescribed level of significance. All these inferential test results imply that there was a significant association between teachers' related factors and mathematics achievement, which disproves the assertion of the third null hypothesis, H_{03} . The null hypothesis was therefore not accepted.

These findings correspond with those of the study by Ansah, J. K., Mensah, N., & Wilmot, E. M. (2020), who found that teacher subject matter knowledge and experience significantly influenced the performance of students in mathematics. Similarly, Uchang, J. T. (2022) found that teacher pedagogical skills and instructional practices had a significant impact on the performance of rural students in mathematics. Furthermore, a study by Baafi (2020) found that teacher-student relationship significantly predicted students' achievement in mathematics. In their research, they showed that positive teacher-student relationships were important for creating a positive learning environment, which in turn, helped to improve students' academic performance in mathematics.

4.7 Learner Related Factors and Academic Achievement in Mathematics

The final objective of the study was to establish the effect of learner related factors on academic achievement in mathematics in Marigat sub-county. The findings are discussed as follows.

4.7.1 Students' and teachers' responses on learner related factors.

The questionnaires had a Likert that contained items that assessed teachers and students' view about the learner related factors in their schools. Table 4.11 summarizes these views.

Table 4.11: Teachers' and Students' view on Learner Related Factors

Statement	5	4	3	2	1	Mean	SD
Teachers							
Many students feel they have no ability or potential to pass mathematics	16.7	41.7	37.5	4.2	0.0	3.71	.806
Students' attitude towards mathematics greatly influences their performance on the subject.	87.5	12.5	0.0	0.0	0.0	4.88	.338
Most students do not attend class due to absenteeism thus influencing teaching and learning of the subject.	50.0	29.2	12.5	8.3	0.0	4.21	.977
The school reward students whenever they excel in mathematics examinations	8.3	8.3	8.3	33.3	41.7	2.08	1.283
Students							
Mathematics is too complex and is difficult to pass in examination	21.7	20.0	24.2	15.0	19.2	2.90	1.411
Mathematics usually makes me feel uncomfortable and nervous during lesson time.	21.7	15.0	17.5	20.0	25.8	3.13	1.500
Absenteeism affects my performance in mathematics	50.0	11.7	10.0	8.3	20.0	2.37	1.619
School reward students whenever they excel in mathematics examinations	30.0	10.0	10.0	10.0	40.0	3.64	1.488
I always finish my mathematics assignment on time because I enjoy doing and passing will make me pursue my career.	41.7	20.8	14.2	6.7	16.7	2.80	1.728

Source: Field Data (2024)

Table 4.11 displays that 4 (16.7%) of the sampled teachers agreed strongly, 10 (41.7%) agreed, 9 (37.5%) agreed a little, and 1 (4.2%) disagreed that many students feel they have no ability or potential to pass mathematics. The low self-efficacy was also evident in students' data as 26 (21.7%) agreed strongly, 24 (20.0%) agreed, 29 (24.2%) agreed a little, 18 (15.0%) disagreed and 23 (19.2%) disagreed strongly with the statement that mathematics is too complex and is difficult to pass in examination. Similarly, 26 (21.7%) of the students agreed strongly, 18 (15.0%) agreed, 21 (17.5%) agreed a little, 24 (20.0%) disagreed, and 31 (25.8%) disagreed strongly that mathematics usually makes them feel uncomfortable and nervous during lesson time. These statistics suggest that students in most of the public mixed day secondary schools have low mathematics self-efficacy.

These findings in tandem with the study by Lei, et al (2022), who found that most students in Kenyan secondary school have a low sense of self-efficacy in mathematics. As result, these students do not engage in self-regulated learning leading to low achievement in mathematics. Mathematics self-efficacy refers to an individual's belief in their ability to successfully complete mathematical tasks or solve mathematical problems. Studies have shown that students' mathematics self-efficacy can have a significant impact on their academic performance (Baafi, 2020).

In another vein, 12 (50.0%) of the teachers agreed strongly, 7 (29.2%) agreed, 3 (12.5%) agreed a little, and 2 (8.3%) disagreed that most students in their school do not attend class due to absenteeism thus influencing teaching and learning of mathematics. Students also affirmed that high absenteeism was a problem in their schools with 60 (50.0%) agreeing strongly, 14 (11.7) agreeing, 12 (10.0%) agreeing a little that absenteeism affects their performance in mathematics with a paltry 10 (8.3%) disagreeing and 24 (20.0%) strongly disagreeing with the statement.

These findings are compatible with the study by Lematango, S. M. (2021), who observed that absenteeism was a major problem in public day secondary schools located in arid and semi-arid areas of Kenya. The study found that the average absenteeism rate in these schools' ranges from 30% to 50%. Factors such as long-distance commutes, lack of clean water, and high poverty levels were identified as major contributors to absenteeism among students. Lematango, S. M. (2021). further observed that students who are frequently absent from school are more likely to perform poorly on exams and fall behind their peers. The study also found that absenteeism was directly linked to lower rates of graduation and higher rates of school dropout.

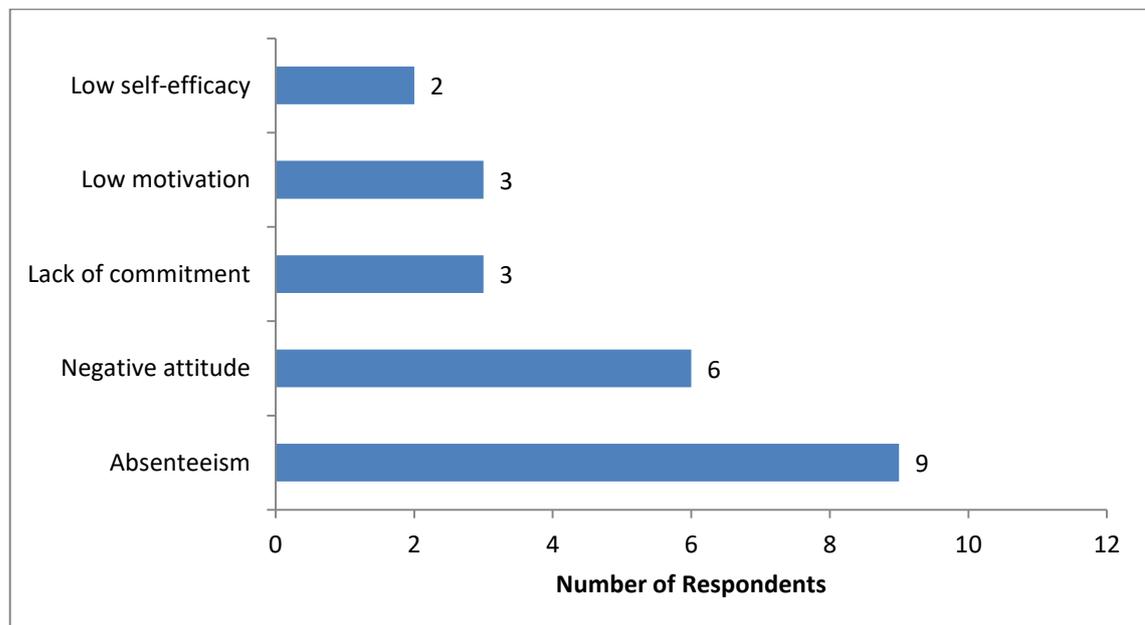
On the other hand, most of the teachers either disagreed 8(33.3%) or disagreed strongly 10(41.7%) with the statement that their school rewards students whenever they excel in mathematics examinations. The lack of reward was also acknowledged by half of the sampled students with 48 (40%) disagreeing strongly and 12(10%) disagreeing with the statement that schools reward students whenever they excel in mathematics examinations. These findings imply that majority of the public mixed day secondary schools in Marigat do not have a system for rewarding students who excel in mathematics.

These findings are congruent with the study by Byleyegu and Gichuru (2019), who found that most secondary schools in rural areas lack adequate resources to establish any reward system for high performing students. The study found that in some cases, schools may provide token rewards such as certificates of achievement or recognition during school assemblies, but these were not consistently implemented across all rural schools and may not have been seen as significant incentives for students to improve their academic performance.

Lastly, 50 (41.7%) of the students agreed strongly, 24 (20.8%) agreed, 17 (14.2%) agreed a little, 80 (67%) disagreed, and 20 (16.7%) strongly disagreed with the assertion that they always finish their mathematics assignment on time because they enjoy doing and understand that passing will make them pursue their career. The finding contradicts earlier findings that showed that most of the students have low mathematics self-efficacy. They also contradict earlier findings that showed high rates of absenteeism among students in the schools.

4.7.2 Principals' Qualitative Reflections on learner related factors

The study also sought the view of principals regarding learner related factor affecting mathematics performance. Figure 4.5 presents the major themes that emerged during the study.



Source: Field Data (2024)

Figure 4.5: Principals view on learner related Factors affecting Mathematics Achievement

Figure 4.5 illustrates that absenteeism was the most recurring theme with 9 out of 12 principals (75%) indicating that this student related factor was affecting mathematics achievement in their school. The second most frequently mentioned theme was negative attitude, with 50% of the interviewed principals indicating that this was a problem in their school. Lack of commitment by the student and low motivation were mentioned by three principals each.

4.4.3 Pearson Correlation of learner related factors and Mathematics Achievement

The Likert scale data on Learner related factors was transformed to a continuous data to test the fourth null hypothesis. The null hypothesis, H_{04} stated as:

H_{04} : *Learner related factors have no statistically significant effect on academic achievement in mathematics in public mixed day secondary schools in Marigat sub-county.*

This hypothesis was tested inferentially using bivariate Pearson's correlation in order to determine the direction and strength of association between the two variables in question. Results were as presented in Table 4.12.

Table 4.12: Correlation Results for Learner Related Factors and Achievement Scores

		Achievement composite score
Learner related factors	Pearson Correlation	.466**
	Sig. (2-tailed)	.000
	N	120

$\alpha = .05$

Source: Field Data (2024)

Results in Table 4.12 shows that there is a moderate positive association between curriculum implementation factors and academic achievement in mathematics [$r = .466$, $p = .000$ at $\alpha = .05$]. The relationship is moderate because the correlation coefficient falls between 0.3 and 0.7. The coefficient is also positive, which implies that better learner related factors are likely to generate better academic achievement in mathematics and vice versa. The association between the two variables was deemed significant because the p-value associated with Pearson correlation was less than 0.05, the set level of significance. All these inferential test results imply that there was a significant association between learner-related factors and mathematics achievement, which contradicts the assertion of the fourth null hypothesis, H_{04} . The null hypothesis was therefore not accepted.

These findings are consistent with the study by Hashim, S., Masek, A., Mahthir, B. N. S. M., Rashid, A. H. A., & Nincarean, D. (2021), who found that students' prior knowledge and understanding of mathematics concepts, their motivation and attitudes towards mathematics, and their study habits and time management skills are all important factors affecting their achievement in mathematics. Smith, A. (2021), also found that students' self-efficacy beliefs in mathematics, their level of perseverance and resilience when faced with mathematical challenges, and their levels of interest and engagement in the subject also play a significant role in their mathematics achievement in rural areas of Kenya. These findings are consistent with the study conducted by Mwangi, P. N., Gitonga, C. M., & Nduati Kariuki, S. (2024), where they also identified students' socio-economic background, parental involvement, and access to learning resources as influential factors on their mathematics achievement in rural areas of Kenya.

4.8 Regression Analysis

To further interrogate the effect of school-based factors on academic achievement in mathematics among learners in public mixed day secondary school, data the four school-based factors (learning environmental factors, curriculum implementation factors, teacher-related factors, and learner-related factors) was regressed against data on learners' achievement in mathematics. Table 4.13 presents a summary of the predictive power of the model.

Table 4.13: Model Summary

Model	R	R Squared	Adjusted R Squared	Std. Error of the Estimate
1	.640 ^a	.411	.406	.308

a. Predictors: (Constant), learning environmental factors, curriculum implementation factors, teacher-related factors, learner-related factors

Source: Field Data (2024)

The model summary in table 4.13 and table 4.14 reveal that school-based factors under study predict learners' academic achievement in mathematics, $R^2=.41$, $F=86.72$, $p<.001$. This implies that school-based factors explained 41.1% of variability observed in learners' academic achievement in mathematics in public mixed day secondary schools in Marigat sub-county. According to Gupta, A., Stead, T. S., & Ganti, L. (2024), an r-squared value of between 0.4 and 0.7 indicates that the model has moderate effect size, which means that the independent variable in the model has a moderate effect on the dependent variables. Table 4.14 presents statistics on the significance of this effect.

Table 4.14: ANOVA Table in SPSS Regression

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	24.717	4	8.239	86.721	.000 ^b
	Residual	7.220	115	.095		
	Total	31.937	119			

a. Dependent Variable: Learners' achievement in mathematics

b. Predictors: (Constant), learning environmental factors, curriculum implementation factors, teacher-related factors, learner-related factors

Source: Field Data (2024)

The ANOVA results further indicate that the relationship between the four school-based factors and learners' academic achievement in mathematics is statistically significant [F=86.72, $p < .001$, $\alpha = .05$]. Gupta, et al (2024). explained that the term statistically significant means that the relationship between variables of the study is not a result of chance. The strength of the F-value also suggests that the model explains a substantial portion of the variation in performance. These affirmative results allowed the researcher to proceed with regression analysis. Table 4.15 shows the effect of each of the four school-based factors in learners' academic achievement when these factors are considered individually.

Table 4.15: Regression Coefficients

Model		Unstandardized		Standardized		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	.499	.235		2.120	.037
	Learning environmental	.056	.037	.148	1.514	.164
	Curriculum implementation	.530	.064	.553	8.281	.000
	Teacher -related	.158	.064	.201	2.469	.015
	Learner related	.243	.071	.272	3.423	.001

a. Dependent Variable: Learners' achievement in mathematics

Source: Field Data (2024)

Results in Table 4.15 illustrate that learning environmental factors did not have a statistically significant effect academic achievement in mathematics [$t= 1.514$, $\beta= .056$, $p>0.05$]. These results meant that the first null hypothesis of the study, which stated that *learning environmental factors have no statistically significant effect on academic achievement in mathematics in public mixed day secondary schools in Marigat sub-county* was affirmed.

On the other hand, results show that curriculum implementation factors had a statistical and positive effect on learners' achievement in mathematics [$t=8.281$, $\beta= .530$, $p<0.05$]. Results imply that a unit improvement in curriculum implementation factors would increase mathematics achievement score by 0.530 units. Therefore, the second hypothesis of the study, which stated that *curriculum implementation factors have no statistically significant effect on academic achievement in mathematics in public mixed day secondary schools in Marigat sub-county* was rejected.

Similarly, results denote that teacher-related factors also had a statistically significant and positive effect on learners' achievement in mathematics [$t=2.469$, $\beta= .158$, $p<.05$].

Specifically, the results imply that a unit improvement in teacher-related factors would increase the mathematic achievement score by 0.158 units. The results led to the rejection of the third hypothesis of the study, which stated that *Teacher related factors have no statistically significant effect on academic achievement in mathematics in public mixed day secondary schools in Marigat sub-county.*

In addition, results showed that learner-related factors have a statistically significant and positive effect on the academic achievement in mathematics of learners in public mixed day secondary schools in Marigat Sub-County [$t= 3.423$, $\beta= .243$, $p<.05$]. Precisely, results imply that a unit improvement in learner-related factors would increase mathematic achievement score by 0.243 units. The results led to the rejection of the fourth hypothesis of the study, which stated that *Learner related factors have no statistically significant effect on academic achievement in mathematics in public mixed day secondary schools in Marigat sub-county.*

Based on the results, the solved regression equation was as follows:

$$Y = 0.499 + 0.056X_1 + 0.530X_2 + 0.158X_3 + 0.243X_4$$

With a coefficient of 0.530, curriculum implementation factors (X_2) have had the largest positive effect on learners' Mathematics achievement in KCSE examination. A one-unit increase in curriculum implementation factors is associated with a 0.530 increase in learners' achievement, holding other factors constant. This is the strongest predictor.

Learner-related factors (X_4) have the second strongest positive predictor mathematics achievement. The coefficient is 0.243, indicating that a one-unit increase in learner-related factors is associated with a 0.243 increase in learners' achievement, holding other factors constant.

With a coefficient of 0.158, a one-unit increase in teacher-related factors (X_3) is associated with a 0.158 increase in learners' achievement, holding other factors constant. Although the magnitude of effect is lower than that of curriculum implementation and learner-related factors, it is still statistically significant.

Learning environmental factors (X_1) have the smallest positive effect on students' achievement in Mathematics. A unit improvement in these factors is associated with a 0.056 increase in achievement, holding other factors constant. This effect is not statistically significant.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.0. Overview

This chapter represents the culmination of the research into effect of school-based factors on learners' KCSE achievement in mathematics in public mixed day secondary schools in Marigat sub county, Baringo County. The chapter presents a summary of the findings, conclusion, and recommendations of the study.

5.1 Summary of Findings

Questionnaires were used to collect data from a sample of 24 teachers and 120 students from 12 public mixed day secondary schools in the study area. Interviews were also used to collect qualitative data from the school principals. Document analysis was also used to verify and collect data. The following are the key findings based on the objective of the study:

5.1.1 Learning Environment Factors and Mathematics Achievement

The first objective of the study was to establish the effect of learning environmental factors on academic achievement in mathematics in public mixed day secondary schools in Marigat sub-county. Descriptive analysis showed that there were adequate teaching and learning resources in the school, an environment that is safe and conducive for learning and teaching, trust between teachers and students, and a culture that encourages achievement in most of the schools. However, qualitative data from the principals indicated that that insecurity and lack of adequate teaching and learning facilities were a problem in the schools. Quantitative and qualitative data agreed that schools in Marigat were grappling with harsh climatic conditions that made learning difficult particularly in the afternoon. The Pearson correlation analysis showed that there was no statistically

significant relationship between learning environment factors and mathematics achievements in the schools ($r= 0.054$, $p= 0.560$). The linear regression analysis confirmed that learning environment indeed does not have a statistically significant effect on learners' achievement in mathematics ($\beta= .056$. $p>0.05$).

5.1.2 Curriculum Implementation Factors and Mathematics Achievement

The second objective was to determine the effect of curriculum implementation factors on academic achievement in mathematics in public mixed-day secondary schools in Marigat Sub-County. Descriptive statistics indicated that teachers in the schools had incorporated student-centred teaching methods in their teaching and instructional materials were available in their respective schools, teachers were using teaching and learning aids in mathematics lesson, and that there was regular assessment of students using diverse assessment strategies. However, the data revealed that struggling students were not receiving special attention such as extra remedial. On the other hand, qualitative data showed that inadequate materials and high students' absenteeism were hampering the implementation of the curriculum leading to poor achievement. The Pearson correlation test revealed that there was a moderate positive and statistically significant relationship between curriculum implementation factors and academic achievement in mathematics within the schools ($r= 0.551$, $p<.05$). Regression analysis affirmed that curriculum implementation factors contribute on learners' achievement in mathematics ($\beta= .530$. $p<0.05$).

5.1.3 Teacher Related Factors and Mathematics Achievement

The third objective was to examine the effect of teacher-related factors on academic achievement in mathematics in public mixed day secondary schools in Marigat sub-County. Descriptive analysis suggested that there was a shortage of staffing of mathematics teachers in the schools but teachers in most schools were punctual, highly

committed and had a positive attitude towards teaching. The teachers also made use of teaching and learning aids, inspired and motivated students, and gave students assignments and feedback. However, most schools do not have programmes for rewarding teachers whenever there is improvement in mathematics. However, qualitative data from the principals indicate that high workload, low commitment from teachers, and inadequate preparation were the teacher related factors affecting mathematics performance in their schools. The Pearson correlation showed that there is weak positive and statistically significant relationship between teacher-related factors and achievement in mathematics ($r= .308, p=.001$). These findings were reinforced by the results of the regression analysis ($\beta= .158, p<.05$).

5.1.4 Learner Related Factors and Mathematics Achievement

The final objective was to establish the effect of learner related factors on academic achievement in mathematics in Marigat sub-county. Descriptive statistics showed that there is low sense of mathematics self-efficacy and high absenteeism among students in most of the schools in the study area. Similarly, most schools did not have programmes for rewarding students for performing well in mathematics. Qualitative data also highlighted that absenteeism and negative attitude towards mathematics among the students were the main learner related factors affecting mathematics achievement in most public mixed day secondary schools in Marigat. The Pearson correlation analysis showed that there is a moderate positive and statistically significant relationship between learner related factors and mathematics achievement in the schools ($r=0.466, p<.05$). The findings are also supported by results of linear regression analysis ($\beta= .243, p<.05$).

5.2. Conclusions of the Study

Based on the findings, the study concludes that learning environment factors do not have a statistically significant effect on academic achievement in mathematics. Despite the established importance of a positive and supportive learning environment in fostering student engagement and motivation, the analysis indicates that these factors alone do not directly translate into improved academic performance in mathematics. This finding suggests that while aspects such as classroom climate, physical space, and peer interactions may influence other areas of student development, their direct impact on mathematics achievement may be weaker than anticipated. It underscores the need for a more nuanced understanding of how environmental factors interact with other educational elements, such as curriculum implementation and teacher quality, to collectively shape academic outcomes.

On the other hand, the findings indicate that curriculum implementation factors have a moderate, positive, and statistically significant effect on academic achievement in mathematics. This means that when key elements of curriculum implementation—such as teacher preparedness, resource availability, alignment between teaching practices and curriculum objectives, and administrative support—are effectively managed, students are likely to perform better in mathematics. While the effect is positive, it is moderate, suggesting that curriculum implementation is an important, but not sole, determinant of academic success. Other factors, such as teacher qualities and learner-related variables, also play a role in shaping student outcomes. These findings underscore the significance of a well-implemented curriculum in enhancing student performance in mathematics but also point to the need for a comprehensive approach that integrates multiple factors to maximize achievement.

Moreover, the findings reveal that teacher-related factors have a weak but positive and statistically significant effect on academic achievement in mathematics. While the influence of teacher qualifications, experience, and pedagogical skills is positive, the effect size is relatively small, indicating that these factors alone contribute only modestly to student performance in mathematics. This suggests that, although important, teacher-related factors are not the sole determinants of academic success. Other elements, such as curriculum implementation and learner-related factors, likely interact and play a more substantial role in shaping student outcomes. The weak effect emphasizes the need for a holistic approach to improving academic achievement, where teacher-related factors are integrated with other critical components like effective teaching strategies, a supportive learning environment, and student motivation.

Lastly, the study concludes that learner-related factors have a moderate, positive, and statistically significant effect on academic achievement in mathematics. This indicates that factors such as motivation, prior knowledge, socio-economic background, and learning styles play a meaningful role in shaping students' performance in mathematics. While these learner-related factors have a noticeable impact, the effect is moderate, implying that they are important but not the sole contributors to academic success. Other factors, including curriculum implementation and teacher-related influences, also interact to influence student achievement. These findings highlight the importance of addressing learner-related factors as part of a comprehensive approach to improving mathematics outcomes, while recognizing that they must be considered alongside other critical educational elements for maximum effectiveness.

5.3 Recommendations of the Study

Based on the finding from this study, the following recommendations were made.

- i. The Study shows that specific factors in the learning environment, including classroom arrangement and overall infrastructure, do not significantly affect academic achievement in mathematics. Although these factors help create a conducive learning atmosphere, they do not directly affect student outcomes. Educators and policy makers should therefore concentrate on methods that boost student engagement, such as interactive teaching techniques and tailored learning strategies. Moreover, cultivating a supportive classroom environment that promotes collaboration, and critical thinking which may yield better results in enhancing mathematical performance than simply improving physical learning conditions.
- ii. The implementation of the curriculum must emphasize organized instructional strategies, the incorporation of practical applications, and personalized learning approaches. Educators and policy makers should adopt a comprehensive curriculum that blends both specialized and interdisciplinary content which enhance student achievement. Furthermore, equipping educators with sufficient training and resources to apply research-supported teaching practices enhances mathematics achievement. Educational institutions should focus on curriculum frameworks that promote analytical skills and critical reasoning, guaranteeing that students experience relevant and stimulating mathematical education.
- iii. Regarding factors related to teachers, the researcher recommends improving professional development programs for teachers to refine their instructional methods, promoting constructive teacher-student interactions to enhance student engagement, and advocating for reflective teaching practices to meet varied learning requirements. Furthermore, equipping teachers with sufficient resources and support can optimize their effectiveness in influencing student outcomes,

thereby ensuring that even minor advancements play a role in achieving broader academic success.

- iv. Regarding learner related factors, it is essential for educators and policymakers to concentrate on factors related to learners that have demonstrated a moderate, positive, and statistically significant impact. Important suggestions include promoting a growth mindset among students, facilitating active participation in problem-solving, and offering tailored support to enhance self-efficacy in mathematics. Furthermore, organized parental involvement, including mentoring strategies, has been shown to positively influence student outcomes. Schools' ought to adopt evidence-based interventions that tackle learning anxiety and motivation, ensuring that students are provided with the requisite encouragement and resources to succeed.

5.4 Suggestions for Further Studies

Themes for further studies on the effect of school-based factors on learners' academic achievement in mathematics in public mixed day secondary schools in remote regions like Marigat sub county should focus on.

- i. the role of teacher effectiveness and instructional practices in resource-constrained environments. Given the persistent shortage of qualified mathematics educators and restricted access to specialized training, it is essential to examine how these obstacles affect teaching quality and student learning outcomes. Analyzing the implementation of improvised teaching techniques, collaborative efforts among teachers, and the establishment of support networks in such contexts may provide valuable insights into strategies that sustain instructional quality despite systemic challenges.

- ii. exploring the effects of teacher workload and the necessity for multi-subject teaching on mathematics performance which would enhance our understanding of the professional demands faced by educators in remote mixed day schools.
- iii. the role of school infrastructure, educational resources, and effective time management in influencing mathematics achievement in these institutions. Numerous remote public mixed day schools encounter difficulties due to insufficient facilities, inconsistent student attendance, and limited access to textbooks or technology. Evaluate how these circumstances impact student engagement and academic performance, as well as how innovative approaches such as, mobile learning, community-based educational centers, or targeted governmental initiatives might address resource deficiencies.
- iv. examine the effects of gender dynamics, school leadership, and parental involvement on shaping student attitudes and performance in mathematics, particularly in mixed-gender environments. Gaining a deeper understanding of these intricate interactions can inform the creation of context-sensitive interventions aimed at enhancing educational equity and learning outcomes in remote secondary schools.

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APPENDICES**APPENDIX I: LETTER OF INTRODUCTION**

BOMET UNIVERSITY COLLEGE

P.O BOX 701-20400

BOMET

8th March 2023.

TO WHOM IT MAY CORNCERN

Dear Sir/Madam,

RE: MASTER OF EDUCATION RESEARCH PROJECT

I am a Post Graduate student at Bomet University College. I am carrying out research on effect of school-based factors on learners KCSE Academic achievement in mathematics in Marigat sub-county. I have identified your school as one of the leading participants and contributors to this study and would like to enlist your support in data collection by requesting you to complete the following questionnaire which is meant to facilitate the completion of my study.

Kindly note that the questionnaire is designed for the purpose of this study only and therefore the response shall be confidential.

I thank you in advance for your time and effort.

Yours Sincerely

RONALD ROP R

APPENDIX II: QUESTIONNAIRE FOR TEACHERS.

This questionnaire seeks to investigate school-based factors that influence learners' academic achievement in mathematics in public secondary schools in Marigat sub-county. Please answer all the questions as honestly as possible.

Do not write your name. Respond to the questions using a tick or other mark or making appropriate answer bold

Section A; Background information

1. Gender :

Male []

Female []

2. Your Age:

Below 40 Years []

41 – 50 Years []

Over 51 Years []

3. How many years have you served in your current school?

1 – 5 Years []

6-10 Years []

Over 10 Years []

5. How long have you taught mathematics?

<5 []

6-10 []

11-15 []

>16 []

SECTION B: LEARNING ENVIRONMENT FACTORS

The purpose of this section is to assess learning environmental factors which can have influence on academic achievement in mathematics. Kindly respond to each statement using answers ranging from strongly agreed to strongly disagree. Rate your level of agreement with the statement by ticking on the appropriate column according to the scale below, AS- (Strongly Agree) =5, A- (Agree) = 4, AA-(A Little Agree) =3, D- (Disagree) =2, SD (Strongly Disagree) =1.

Statements	5	4	3	2	1
1. There are adequate teaching and learning facilities in the school such as classroom, library which enhance learning.					
2. The harsh climatic conditions such as high temperature interrupt afternoon lessons.					
3. My school is safe and conducive for learning and teaching					
4. In my school, student and teachers trust one another and work towards common interest.					
5. The school has culture of mathematics to improve performance in mathematics which encourage diversity and celebrating achievement					

SECTION C: CURRICULUM IMPLIMENTATION FACTORS

The table below gives some statements regarding curriculum implementation factors and their influence on academic achievement in mathematics Rate your agreement with the statements according to the scale below.

SA- (strongly Agree) =5, A-(Agree) =4, AA- (A Little Agree) =3, D-(Disagree) =2, SD- (Strongly Disagree) =1

Statements	5	4	3	2	1
1. Teachers uses different teaching methods other than lecturing during mathematics lesson such as group discussion					
2. Weak students in mathematics are given special attention such as extra remedial					

3. Availability of teaching and instructional materials have a great potential of improving performance in mathematics					
4. Teachers use teaching and learning aids during mathematics lesson					
5. Students are regularly assessed by use of varied strategies to enhance performance					

SECTION D: TEACHER RELATED FACTORS

Kindly respond to each statement using answers ranging from strongly agreed to strongly disagree. Rate your level of agreement with the statement by ticking on the appropriate column according to the scale below, SA- (Strongly Agree) =5, A- (Agree) = 4, AA-(A Little Agree) =3, D-(Disagree) =2, SD - (Strongly Disagree) =1.

Statement	5	4	3	2	1
1. Mathematics teachers attend lesson on time and are committed to their work.					
2. Mathematics teacher to student ratio is low making it impossible for the teacher to interact with students.					
3. Teaching mathematics is tiresome and boring.					
4. Math's teachers are rewarded whenever there is improvement in mathematics					
5. Mathematics teachers have adequate time to prepare lesson plan.					

SECTION E: LEARNER RELATED FACTORS

The table below gives some statements regarding student related factors and their influence on academic achievement in mathematics. Rate your agreement with the statements according to the scale below.SA- (strongly Agree) =5, A-(Agree) =4, AA-(A Little Agree) =3, D-(Disagree) =2, SD-(Strongly Disagree) =1

Statements	5	4	3	2	1
1.. Many students feel they have no ability or potential to pass mathematics					
2. Students attitude towards mathematics greatly influences their performance on the subject.					
3. Most students don't attend class due to absenteeism thus influencing teaching and learning of the subject.					
4.The school reward students whenever they excel in mathematics examinations					

SECTION F: ACHIEVEMENT IN MATHEMATICS IN KCSE

Summary of performance in mathematics for the last 5 years

KCSE YEAR	MATHEMATICS MEAN SCORE
2019	
2020	
2021	
2022	
2023	

_____THANK YOU_____

APPENDIX III: QUESTIONNAIRE FOR STUDENTS

This questionnaire seeks to investigate school-based factors that influence learners KCSE academic achievement in mathematics in public secondary schools in Marigat sub-county. Please answer all the questions as honestly as possible.

Do not write your name. Respond to the questions using a tick or other mark or making appropriate answer bold and where a question requires you to write down then be brief as possible.

Section A; Background information

1. Gender :

Male

Female

2. Your Age:

Below 16 Years

17 – 20 Years

Over 20 Years

SECTION B: LEARNING ENVIRONMENTAL FACTORS

The purpose of this section is to assess Attitude towards mathematics which can have influence on academic achievement in mathematics. Kindly respond to each statement using answers ranging from strongly agreed to strongly disagree. Rate your level of agreement with the statement by ticking on the appropriate column according to the scale below, SA- (Strongly Agree) =5, A- (Agree)= 4, AA-(A Little Agree) =3, D-(Disagree)=2, SD -(Strongly Disagree)=1.

Statements	5	4	3	2	1
1. There is enough teaching and learning facilities in the school such as classroom, library which enhance learning					
2. The harsh climatic conditions such as high temperature interrupt afternoon lessons.					
3. My school is safe and Conducive for learning.					
4. In my school, student and teachers trust one another and work towards common interest.					
5. The school has culture of mathematics to improve performance in mathematics which encourage diversity and celebrating achievement					

SECTION C: CURRICULUM IMPLEMENTATION FACTORS

The table below gives some statements regarding curriculum related factors and their influence on academic achievement in mathematics Rate your agreement with the statements according to the scale below.SA- (strongly Agree) =5, A-(Agree) =4, AA-(A Little Agree) =3, D-(Disagree) =2, SD-(Strongly Disagree) =1

Statements	5	4	3	2	1
1. Teachers use different teaching methods other than lecturing during mathematics lesson such as group discussion					
2. weak students in mathematics are given special attention such as extra remedial					
3.Availability of teaching and instructional materials have a great potential of improving performance in mathematics					
4. Teachers use teaching and learning aids during mathematics lesson					
5. Students are regularly assessed by use of varied strategies to enhance performance					

SECTION D: TEACHER RELATED FACTORS

The purpose of this section is to assess student motivation which can have influence on academic achievement in mathematics. Kindly respond to each statement using answers ranging from strongly agreed to strongly disagree. Rate your level of agreement with the statement by ticking on the appropriate column according to the scale below, A- (Strongly Agree) =5, A- (Agree)= 4, AA-(A Little Agree) =3, D-(Disagree)=2, SD - (Strongly Disagree)=1.

Statements	5	4	3	2	1
1. There is enough mathematics teachers in the school who always come for lessons					
2. Teachers use teaching and learning aids during mathematics lesson.					
3. Mathematics teachers have made me feel I could pass well in mathematics.					
4. Teachers motivate us whenever we perform well in mathematics.					
5. Teachers always give us assignment, and they mark our work as well as doing correction for us.					

SECTION E: LEARNER RELATED FACTORS

The table below gives some statements regarding student related factors and their influence on academic achievement in mathematics. Rate your agreement with the statements according to the scale below.SA- (strongly Agree) =5, A-(Agree) =4, AA-(A Little Agree) =3, D-(Disagree) =2, SD-(Strongly Disagree) =1

Statements	5	4	3	2	1
1.. Mathematics is too complex and is difficult to pass in examination					
2. Mathematics usually makes me feel uncomfortable and					

nervous during lesson time.					
3.Absenteesism affects my performance in mathematics					
4. I always finish my mathematics assignment on time because I enjoy doing and passing will make me pursue my career.					
5.school reward students whenever they excel in mathematics examinations					

_____THANK YOU_____

APPENDIX IV: INTERVIEW SCHEDULE FOR PRINCIPAL

The purpose of this interview schedule is to collect data on factors influencing academic achievement in mathematics in public secondary school please respond to the questions to the best of your ability.

1. Generally, describes the performance in mathematics in your school.
2. Describe how learning environmental factors affect academic achievement in mathematics in your school.
3. What are the challenges in curriculum implementation which affect achievement in mathematics in your school?
4. Describe teacher related factors which affect academic achievement in mathematics.
5. Explain how student related factors affect academic achievement in mathematics in your school.

_____ **THANK YOU** _____

APPENDIX V: DOCUMENT ANALYSIS CHECKLIST

1. Type of Document: _____

2. Source of the Document: _____

3. Date of production: _____

4. Information on Students Mathematics Achievement in KCSE

Mean score: _____

Number of candidates: _____

Percentage of candidate with the following grades:

A: _____

C: _____

A-: _____

C-: _____

B+ _____

D+: _____

B: _____

D: _____

B-: _____

D-: _____

C+: _____

E: _____

Pass rate: _____

Any note or comment:

APPENDIX VI: RESEARCH AUTHORIZATION



BOMET UNIVERSITY COLLEGE

(A Constituent College of Moi University)

Post Office Box 701-20400, Bomet - Kenya. E-Mail: bpgs@buc.ac.ke

DEPARTMENT OF POSTGRADUATE STUDIES, PARTNERSHIPS AND LINKAGES

Ref: SOE/MED/005/2021

Date: 5th August 2024

TO WHOM IT MAY CONCERN

**RE: APPROVAL OF RESEARCH PROPOSAL FOR RONALD ROP
SOE/MED/005/2021**

The above named is registered in the programme of **MASTER OF EDUCATION IN MATHEMATICS EDUCATION** in the School of Education, Bomet University College. This is to confirm that his research proposal titled **"EFFECTS OF SCHOOL BASED FACTORS ON LEARNERS' ACADEMIC ACHIEVEMENT IN MATHEMATICS IN PUBLIC MIXED DAY SECONDARY SCHOOLS IN MARIGAT SUB-COUNTY, KENYA."** has been approved for conduct of research subject to obtaining all other permissions/clearances that may be required before hand.

Yours sincerely,


ACADEMICS
 Prof. Patrick B. Ojera, PhD
 Box 701 - 20400
BOMET
HEAD OF POSTGRADUATE STUDIES, PARTNERSHIPS AND LINKAGES
 Copy to: *Principal*
Deputy Principal (A&SA)
Dean, School of Education
Head of Department

Green Economy for Sustainability

APPENDIX VII: RESEARCH PERMIT



BOMET UNIVERSITY COLLEGE
(A Constituent College of Moi University)
SCHOOL OF EDUCATION
OFFICE OF THE DEAN

Email: deansoed@buc.ac.ke

Web: www.buc.ac.ke

P. O. Box 701-20400
BOMET, KENYA

REF: SOE/MED/005/21

DATE: 4th October, 2023

THE EXECUTIVE SECRETARY,

National Commission for Science, Technology and Innovation,
P.O. Box 30623-00100,
Nairobi.

Dear Sir/Madam,

RE: RESEARCH PERMIT IN RESPECT OF ROP RONALD R. SOE/MED/005/21

The above named is a second year Master of Education student at Bomet University College, School of Education, Department of Curriculum Instructions and Management.

It is required of his Master of Education studies to conduct research and write a thesis on a specific topic related to the area of specialization. His research topic is entitled: **“Influence of School Based Factors on Learners’ Academic Achievement in Mathematics in Public Mixed Day Secondary Schools in Marigat Sub- County, Kenya”**

Any assistance given to enable him conduct research successfully will be highly appreciated.

Yours faithfully,

Dr. John M. Momanyi PhD
DEAN, SCHOOL OF EDUCATION



APPENDIX VIII: RESEARCH AUTHORIZATION LETTER

REPUBLIC OF KENYA
MINISTRY OF EDUCATION
State Department for Basic Education

Our Email: countyedubaringo@gmail.com

*COUNTY DIRECTOR OF EDUCATION
BARINGO COUNTY
P.O. BOX 664
KABARNET*

REF: CDE/BAR/EDU 8/11 VOL 2/51

20/11/2023

Mr. Rop R. Ronald
Application Identification Number 676484
Bomet University College

RE : RESEARCH AUTHORIZATION

Reference is made to research license No. NACOSTI/P/23/30917 dated 03/11/2023.

Authority is hereby granted to you to carry out research on: ***School based factors on learners' academic achievement in mathematics in public mixed day secondary schools in Marigat Sub County, Baringo County,*** for a period ending 03/11/2024.

A handwritten signature in blue ink, appearing to read 'Masibo J. Kituyi', with a long horizontal line extending to the right.

Masibo J. Kituyi
County Director of Education
BARINGO COUNTY

CC

Sub County Director of Education
Marigat

APPENDIX X: MAP OF THE STUDY AREA

