INFLUENCE OF MASTERY LEARNING APPROACH IN SCIENCES ON STUDENTS' ACADEMIC PERFORMANCE. A CASE STUDY OF GARISSA COUNTY, KENYA.

CHRIS ODULA

A RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF MASTER OF EDUCATION DEGREE IN LEADERSHIP AND MANAGEMENT OF

MOUNT KENYA UNIVERSITY

APRIL 2024

DECLARATION

This project is my original work and has never been presented for any academic award in any institution.

Name: ODULA JONES CHRIS

Reg. No: MED/00/1122/05737

Signature: ..... Date: 9/6/2025

APPROVAL

This project is being submitted for examination with our approval as university supervisors.

Name: DR. PEACE BYRNE AGUFANA

Institution Affiliation: MURANG'A UNIVERSITY OF TECHNOLOGY

Signature: ..... Date: 09/06/2025

DEDICATION

I dedicate this project to my beloved wife, and son Clifford, who ensured that I attend my university studies at all costs. Their genuine concern for my progress at each and every level of my study also deserves a special mention.

ACKNOWLEDGEMENT

I express my gratitude to the Almighty God for His blessings. This research project was made possible through the support, guidance, and assistance of numerous individuals.

I extend sincere appreciation to my supervisor, Dr. Peace Byrne Agufana, for his consistent intellectual and moral support. I am also thankful to the lecturers at Mount Kenya University who aided me in my studies.

Special thanks are due to my classmates, friends, and associates, particularly those who provided encouragement and inspiration. Your presence has been invaluable in my journey. I am deeply grateful to my family and relatives for their unwavering love and support throughout my educational endeavors.

I am also thankful to the school principals, teachers, and students of Secondary Schools in Garissa County, Kenya, for their participation in this study.

MAY GOD BLESS YOU ALL IN ABUNDANCE!

ABSTRACT

This study investigated the influence of the mastery learning approach on students' academic performance in science subjects in public secondary schools in Garissa County, Kenya. Mastery learning is an instructional strategy that emphasizes individualized pacing, continuous assessment, and timely corrective feedback, ensuring that learners attain a high level of comprehension before advancing to new concepts. The study sought to evaluate the effectiveness of this approach in improving science education outcomes, particularly in underperforming and resource-constrained regions such as Garissa County. The study was guided by four specific objectives: to assess the influence of monitoring mastery learning techniques on science learning outcomes of secondary school students in Garissa County; to evaluate the influence of corrective instruction on mastery learning outcomes in sciences among secondary school students; to examine the influence of formative assessment on mastery learning outcomes in sciences; and to evaluate the influence of evaluative mastery learning on science learning outcomes among secondary school students in Garissa County. Grounded in Robert Gagne's Conditions of Learning Theory, the research employed a mixed-methods approach, integrating both quantitative and qualitative methodologies. A purposive sample of 80 respondents was selected, comprising 5 principals, 5 deputy principals, 20 science teachers, and 50 students drawn from five public secondary schools. Data collection instruments included structured questionnaires, interview guides, and document analysis. Quantitative data were analyzed using descriptive statistics and Pearson's correlation analysis, while qualitative data were coded thematically to identify emerging patterns. The findings demonstrated statistically significant positive correlations between mastery learning components and students' academic performance. Corrective instruction exhibited the strongest correlation ($r = 0.723$, $p = 0.000$), followed by evaluative learning ($r = 0.606$, $p = 0.000$), and formative assessment ($r = 0.558$, $p = 0.000$). Monitoring techniques were also found to be critical in supporting instruction, offering real-time feedback, and enhancing learners' progression through the science curriculum. The study concluded that mastery learning enhances academic outcomes by fostering student-centered learning, addressing individual learning needs, and closing performance gaps. It is particularly impactful in marginalised educational settings where traditional methods have underperformed. The study recommends the integration of mastery learning in science instruction, incorporation of mastery principles in teacher training programs, and policy support for resource allocation to facilitate effective implementation. These findings have implications for improving science education quality and equity in Kenya, contributing toward national development goals under Vision 2030.

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LIST OF ABBREVIATIONS

HODs	-	Head of Departments
KCSE	-	Kenya Certificate of Secondary Education
KNEC	-	Kenya National Examination Council
MOEST	-	Ministry of Education, Science, and Technology
WAEC	-	West African Examination Council
NACOSTI	-	National Commission for Science Technology and Innovation

CHAPTER ONE

INTRODUCTION

This chapter dealt with the background of the research, statement of the issue, research objectives and questions, research significance, limitations, and delimitations, theoretical and conceptual frameworks and working dentitions of the key terms.

1.1 Background of the Study

The academic performance of students, particularly in science subjects, is a central indicator of the effectiveness and equity of educational systems. Academic performance is widely understood as the extent to which students achieve learning outcomes, typically measured through examination results, classroom assessments, and cognitive skill development (Gonzalez et al., 2018). Globally, there is increasing concern over declining performance in science disciplines, particularly among students from disadvantaged socio-economic backgrounds. As the demand for science, technology, engineering, and mathematics (STEM) skills grows, ensuring equitable mastery of science concepts has become imperative for economic competitiveness and sustainable development (OECD, 2019). Educational researchers have turned their attention to instructional models that prioritize deeper understanding and conceptual mastery among them, the mastery learning approach.

The mastery learning approach, developed by Bloom (1968) and expanded through contemporary education research, is an instructional strategy that ensures students attain a specific level of understanding before progressing to new content. Unlike traditional models that move all students through curriculum regardless of readiness, mastery learning involves continuous assessment, immediate feedback, corrective instruction, and individualized pacing (Guskey, 2017). In the United States, studies

have demonstrated that mastery learning improves academic outcomes in science by offering timely interventions to learners, particularly those struggling with foundational concepts. A study by the Modern Classrooms Project (2021) found significant gains in student achievement and engagement in secondary school science after the integration of mastery learning, with underperforming students closing achievement gaps at accelerated rates.

In the United Kingdom, mastery learning has been central to pedagogical reforms in science education. The Education Endowment Foundation (EEF, 2018) evaluated a large-scale mastery intervention across 40 secondary schools and reported statistically significant improvements in students' attainment in science assessments. The study emphasized the importance of sustained monitoring, formative evaluation, and the use of adaptive instructional strategies to enhance conceptual understanding in science. Notably, the intervention was most effective among students from low socio-economic backgrounds, underscoring its potential to promote academic equity in science learning.

Australia has also adopted mastery learning as a strategy to address disparities in student performance across school systems. According to the Australian Education Research Organisation (AERO, 2021), mastery-based approaches in science significantly improved student retention of concepts, especially when combined with diagnostic assessments and differentiated instruction. In a nationwide review of mastery-based initiatives, schools reported greater teacher efficacy and student self-efficacy, which were directly linked to improved academic performance in STEM subjects. Mastery learning allowed educators to tailor science instruction to student needs, fostering deeper learning and skill transfer.

In Canada, mastery learning has been implemented in remote and multicultural school settings to mitigate performance gaps in science education. A study by Tremblay and

Pelletier (2020) observed that mastery learning strategies particularly those involving continuous feedback and collaborative assessments improved academic performance among Indigenous students in Quebec. The study highlighted how culturally responsive mastery learning techniques can be leveraged to support underrepresented groups in achieving science literacy. These findings suggest that mastery learning holds promise not only for improving academic performance broadly, but also for addressing equity gaps in access to quality science education.

In Africa, mastery learning has been gradually introduced as a pedagogical innovation to respond to persistent challenges in science education, including poor performance, lack of conceptual understanding, and large class sizes. In Nigeria, a quasi-experimental study by Okoye and Okechukwu (2019) found that students taught using mastery learning in physics outperformed those taught using conventional methods, with significant improvements in concept retention and test scores. The authors attributed this success to the use of formative assessment and corrective feedback, which enabled learners to internalize scientific principles before progressing. The findings reinforce the role of mastery learning in transforming science instruction in developing education systems.

Ghana has also made strides in integrating mastery learning principles into science instruction. A study by Tetteh and Boakye (2021) examined the effects of formative assessment and corrective teaching key components of mastery learning on the science performance of junior high school students. The results showed a marked increase in test performance and class participation among students in the experimental group. Teachers also reported improved learner engagement and reduced behavioral problems, suggesting that mastery learning can contribute to holistic educational outcomes. The

study called for systemic adoption of mastery learning strategies in teacher training programs and national curricula.

In South Africa, mastery learning has been explored as a potential strategy to address the country's low science achievement in national assessments. The Department of Basic Education (2020) reported on pilot projects using mastery learning in rural secondary schools, where students received targeted feedback and remediation sessions in science subjects. The results indicated a measurable improvement in student achievement and motivation, especially among female students who had previously underperformed. Teachers noted that the approach encouraged consistent revision, collaborative learning, and confidence in science problem-solving.

In Uganda, the implementation of mastery learning has been used to address science learning gaps among secondary school students, particularly in biology and chemistry. A study by Namusoke and Nsubuga (2022) found that integrating mastery-based feedback loops into classroom instruction improved students' academic performance and enhanced teacher-student relationships. The research emphasized the role of teacher training and institutional support in sustaining mastery learning models. These insights affirm the adaptability of mastery learning to African educational environments, where structural and instructional challenges often impede science learning.

In Kenya, poor performance in science subjects has remained a critical concern at both national and county levels. According to the Kenya National Examinations Council (KNEC, 2022), science subjects such as physics, biology, and chemistry consistently record lower mean scores compared to humanities and languages. The situation is more dire in marginalised regions like Garissa County, where socio-economic constraints, absenteeism due to nomadic lifestyles, teacher shortages, and limited instructional

resources hinder effective science learning. A recent analysis by the Ministry of Education (2023) revealed that the transition rate of students into science-related careers from North Eastern Kenya is significantly lower than the national average, raising alarm about regional disparities in academic achievement and access to STEM opportunities.

A study by Mwangi and Njoroge (2021) in Kirinyaga County demonstrated that mastery learning significantly enhanced physics performance among form two students when formative assessments and corrective feedback were consistently applied. Although this study was conducted in a relatively better-resourced area, the methodology offers insights applicable to resource-constrained settings like Garissa. The research underscores the importance of individual-paced instruction, continuous monitoring, and targeted support in helping students overcome learning challenges in science. Such pedagogical approaches are particularly critical in regions where conventional teaching methods have failed to produce the desired academic outcomes.

Within Garissa County, limited empirical studies have focused specifically on mastery learning and its relationship with academic performance in science. Yet the county's educational profile characterized by high dropout rates, gender disparities, and poor performance in STEM subjects makes it an ideal setting for such inquiry. Data from the Garissa County Education Office (2023) show that science pass rates at the Kenya Certificate of Secondary Education (KCSE) level are below 30%, significantly trailing the national average. Interviews with school principals and science teachers reveal a lack of structured interventions that address learners' individual pacing needs, especially in science subjects that require conceptual clarity and sequential understanding. This highlights the urgency of implementing evidence-based instructional strategies like mastery learning.

Given the pressing challenges in science education within Garissa and the growing evidence of mastery learning's effectiveness in similar contexts, this study seeks to assess the influence of mastery learning on students' academic performance in science subjects. Specifically, it examines how components such as monitoring learning techniques, formative assessment, corrective instruction, and evaluative learning affect learners' academic outcomes. By focusing on this region, the study not only contributes to localized education reforms but also aligns with Kenya's broader objectives under Vision 2030 to strengthen science and technology education for national development.

1.2 Statement of the Problem

The persistent underperformance of students in science subjects at the secondary school level remains a significant concern within Kenya's education system. This challenge is particularly acute in marginalized regions such as Garissa County, where socio-economic hardships, high absenteeism, limited instructional resources, and teacher shortages hinder effective teaching and learning. Despite national efforts to promote science, technology, engineering, and mathematics (STEM) education, science subjects such as physics, biology, and chemistry continue to record consistently low achievement levels, as evidenced by successive Kenya Certificate of Secondary Education (KCSE) examination results (KNEC, 2022).

Conventional teaching methods, characterized by a one-size-fits-all approach, have failed to address the diverse learning needs of students, especially in complex and abstract science disciplines. These methods often neglect the individual learner's pace and capacity, leading to cumulative knowledge gaps, diminished motivation, and poor academic outcomes. Mastery learning, which emphasizes individualized instruction, continuous assessment, timely feedback, and remediation, presents a promising

alternative. However, this approach has not been widely implemented or systematically evaluated in Kenya's public secondary schools, particularly in underserved counties like Garissa.

Moreover, while global and regional studies suggest that mastery learning enhances academic performance, there is a lack of localized empirical research assessing its effectiveness in science education within the Kenyan context. Specifically, the influence of key components of mastery learning—monitoring techniques, formative assessment, corrective instruction, and evaluative learning on students' academic performance in sciences has not been adequately explored. The absence of such context-specific data limits the ability of educators and policymakers to design informed interventions aimed at improving science learning outcomes in marginalized regions.

This study therefore seeks to address this gap by investigating the influence of the mastery learning approach on students' academic performance in science subjects in Garissa County. The findings will provide evidence-based insights that can inform instructional practice, teacher training, and education policy, thereby contributing to the broader goal of enhancing equity and quality in science education across Kenya.

1.3 General Objective

The general study objective was to examine the consequence of mastery learning technique on educational outcomes of Secondary School Students in Garissa County in Kenya.

1.4 Objectives of the Study

The current study was guided by the subsequent specific research objectives:

i. To assess the influence of monitoring mastery learning techniques on science learning outcomes of Secondary School Students in Garissa County within Kenya

ii. To evaluate the influence of corrective instruction on mastery learning outcomes of Sciences among Secondary School Students in Garissa County, Kenya.

iii. To examine the influence of formative assessment on mastery learning outcomes of Sciences among Secondary School Students in Garissa County, Kenya.

iv. To evaluate the influence of evaluative mastery learning on Sciences learning outcomes among Secondary School Students in Garissa County, Kenya.

1.5 Research Questions

The researcher endeavored to answer the subsequent research questions:

i. How does monitoring mastery learning techniques influence science learning outcomes of Secondary School Students in Garissa County within Kenya?

ii. What is the influence of corrective instruction on mastery learning outcomes of Sciences among Secondary School Students in Garissa County, Kenya?

iii. How does formative assessment influence mastery learning outcomes of Sciences among Secondary School Students in Garissa County, Kenya?

iv. What is the influence of evaluative mastery learning on Sciences learning outcomes among Secondary School Students in Garissa County, Kenya?

1.6 Justification of the Study

The justification for this study stems from the persistent challenge of low academic performance in science subjects within Kenyan secondary schools, particularly in marginalized regions such as Garissa County. National examinations have consistently

reflected underwhelming results in sciences, which are critical for national development and global competitiveness in science, technology, engineering, and mathematics (STEM) fields. Despite the importance of science education in fostering innovation and technological advancement, learners in Garissa County continue to exhibit poor mastery of scientific concepts, partly due to ineffective pedagogical approaches and systemic learning gaps.

The mastery learning approach, pioneered by educational psychologists such as Bloom (1968), posits that nearly all students can achieve a high level of understanding if provided with appropriate learning conditions, time, and feedback mechanisms. This instructional strategy emphasizes individualized pacing, continuous assessment, corrective instruction, and feedback, which are particularly suited for contexts like Garissa where learners often face unique socio-economic and infrastructural disadvantages including high absenteeism due to nomadic lifestyles and limited teacher-student interaction time.

By focusing on mastery learning techniques such as monitoring, formative assessment, corrective instruction, and evaluative learning, this study responds to the urgent need to explore alternative, evidence-based methods to enhance science learning outcomes. The justification also arises from the observed performance disparities between male and female learners, and between urban and rural settings—gaps which mastery learning has the potential to bridge through personalized and inclusive instructional designs.

Furthermore, this research contributes to the broader pedagogical discourse by providing empirical evidence on the applicability and effectiveness of mastery learning in under-resourced and culturally distinct settings. It seeks to inform educational stakeholders—including the Ministry of Education, school administrators, and teacher

training institutions on scalable practices that can transform science education and align with Kenya's Vision 2030 goals of industrialization and technological innovation.

1.7 Significance of the Study

The significance of this study lies in its potential to inform educational practice, policy, and future research regarding the implementation of mastery learning strategies to improve science education outcomes in Kenya, especially within marginalized regions like Garissa County. The findings of this research are expected to benefit multiple stakeholders across different levels of the education system as follows:

The Ministry will benefit from empirical evidence on the effectiveness of mastery learning approaches in enhancing students' performance in science subjects. The insights from this study can inform the formulation of policies, curriculum reforms, and teacher training programs aimed at improving quality and equity in science education. The Ministry may also use the findings to scale up interventions that align with national education goals, such as Kenya Vision 2030 and the Competency-Based Curriculum (CBC).

KICD, responsible for curriculum design and evaluation, stands to gain practical data on how mastery-based instructional strategies align with curricular expectations and student learning needs. This can guide revisions to curriculum content, structure, and pedagogy, especially in STEM-related disciplines.

Teachers are direct beneficiaries, as the study provides actionable insights into how mastery learning strategies such as formative assessment, corrective instruction, and evaluative learning can enhance instructional effectiveness. The study empowers teachers with evidence-based techniques to support learners at different competency levels and promote inclusive classroom practices.

School heads and administrators will benefit by understanding how mastery learning can be integrated into school-based instructional programs to improve science results. The findings will help in developing monitoring and evaluation frameworks, facilitating professional development for teachers, and allocating resources more efficiently.

Teacher training colleges and faculties of education will find this research useful in enriching their pedagogy courses with mastery learning content. The study advocates for the incorporation of mastery learning theories and practical strategies into teacher preparation programs to produce competent educators for 21st-century classrooms.

KNEC can use the findings to reflect on how assessment formats can support mastery learning objectives. Since mastery learning involves frequent formative and diagnostic assessments, the Council may explore integrating continuous assessment frameworks to complement national examinations.

Students are the primary beneficiaries, as the mastery learning approach promotes personalized learning pathways that accommodate diverse learning speeds and styles. Through this approach, learners are more likely to develop deep conceptual understanding, improve academic confidence, and achieve higher performance in science subjects.

Parents and caregivers will benefit indirectly through improved academic performance and motivation of their children in science subjects. Increased learner success can also translate into reduced school repetition rates and enhanced parental satisfaction with the quality of education provided.

This study contributes to the academic literature on mastery learning in the Kenyan context, offering a basis for further empirical investigations, especially in under-

researched regions. It also opens opportunities for comparative studies across counties and among different learning models.

NGOs working in the education sector, especially those focused on marginalized communities and girls' education, can use the study to design targeted interventions that promote science achievement. The evidence can support funding decisions and strategic planning for donor-supported projects.

1.8 Scope of the Study

The scope of this study defines the boundaries within which the research was conducted in terms of content coverage, geographical location, target population, timeframe, and methodological approach. This delineation ensures the study remains focused, manageable, and relevant to the research objectives.

1.8.1 Subject Scope

This study was delimited to examining the influence of the mastery learning approach on students' academic performance in science subjects specifically biology, chemistry, and physics in public secondary schools in Garissa Township Sub-County, Garissa County, Kenya. The mastery learning components under investigation included monitoring techniques, corrective instruction, formative assessment, and evaluative learning. These components were assessed in relation to students' comprehension, content retention, and academic performance outcomes in science subjects. The study excluded other academic disciplines to allow for a focused analysis within the STEM domain.

1.8.2 Geographical Scope

Geographically, the research was conducted in Garissa Township Sub-County, a region characterized by pastoralist communities, arid climate, and systemic educational

challenges. Five public secondary schools Garissa High School, Iftin Girls, Umusalam Girls, Boystown Secondary School, and Mnara Mixed Secondary School—were purposively selected based on factors such as accessibility, school size, and gender representation.

1.8.3 Population Scope

In terms of population scope, the study targeted four categories of respondents actively involved in science instruction and learning: school principals, deputy principals, science teachers, and students. A total of 80 participants were engaged in the study, comprising 5 principals, 5 deputy principals, 20 teachers, and 50 students.

1.8.4 Methodological Scope

Methodologically, the study adopted a mixed-methods approach combining both quantitative and qualitative techniques. Quantitative data were collected through structured questionnaires, while qualitative data were gathered via interviews and document analysis. Statistical analysis included descriptive statistics and Pearson's correlation to examine relationships among the variables.

1.8.5 Temporal Scope

Temporally, the study was conducted between January 2023 and April 2025. The academic performance indicators assessed were based on examination results and instructional feedback data from the years 2019 to 2023, thereby offering a recent and relevant timeline for evaluating the effectiveness of the mastery learning approach.

1.9 Limitations of the Study

In the course of the study, the researcher was subjected to the following limitations:

i. Insecurity and undeveloped infrastructure in the study area may limit movement.

ii. Given the nomadic lifestyle in the study area girls may not share freely.

iii. Adverse weather conditions may hinder the study since the area is prone to high temperatures.

1.10 Delimitations of the Study

This study was faced with the following delimitations:

Resource Constraints: The study may be constrained by limitations in resources such as time, funding, and access to data, which could influence the depth and breadth of the research.

External Factors: External factors such as socio-economic conditions, cultural influences, and educational policies may affect the findings but are not within the scope of this study.

Participant Characteristics: The study may be delimited by specific characteristics of the participants, such as age, gender, or socio-economic status, which could limit the generalizability of the results.

Educational Context: The study is conducted within the context of the educational system in Garissa Sub-County, which may differ from other educational systems and contexts.

Validity of Instruments: The study relies on the validity of the assessment instruments used to measure mastery learning and academic performance, which may have limitations.

1.11 Assumption of the Study

The subsequent assumption was tested and ascertained to be valid based on the study findings: There is a significant correlation between mastery learning approach and students' academic performance in sciences.

1.12 Operational Definition of Key Terms

Academic performance – refers to extent to which a teacher and a learner has achieved the set goals and objectives.

Garissa – A County in North-Eastern of Kenya

Mastery – An act of memorizing and recalling content taught in class.

Student – A learner in secondary school in a school set up ready to be instructed by a teacher.

Teacher – A professionally trained person helping a learner acquire desired skills, knowledge, attitudes and values.

Teaching approach – this refers to instructional strategies aimed at helping learners acquire skills, knowledge and attitudes.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter deals with the empirical literature of the study, theoretical framework, conceptual framework, Evaluative Learning and Learning Outcomes, Formative Assessment and Learning Outcomes, Corrective Instruction and Learning Outcomes and Monitoring Learning, Learning Outcomes and finally summary of literature.

2.1 Empirical Literature

The definitive objective of educators is to upsurge learners' yearning to study. There exist numerous issues that influence how abundant a learner studies. Studying is not a single-manner method where an educator places information into learners' heads; it needs the learners to be carried into the erudition process as well. The drive for education is significant for learner achievement. It is likewise a critical constituent when educators are scheming their subjects. Emerging a schoolroom tactic that absolutely moves learner inspiration is a portion of unseen exercise that each educator works to generate. With this notion in cognizance, it is significant to recall that incentive must be at the vanguard of an educator's schoolroom classical enterprise (Olosunde, Oladejo, Isola, Ojebisi & Olawale, 2011).

2.1.1 Monitoring Learning and Learning Outcomes

Deprived educational attainment in sciences might be credited to numerous issues among which educator's plan itself was measured as a significant issue. This suggests that the mastery of science ideas cannot be completely attained deprived of the usage of instructional resources. The instruction of sciences minus teaching resources might certainly lead to unfortunate academic attainment. Okebukola, Jegede and Franzer

(1992) emphasized on a skillfully competent discipline educator nonetheless in what way fit proficient, might be incapable in disseminating his concepts to exercise if the institute scenery deficiencies materials, then equipment essential for one to interpret proficiency addicted to actuality. Changeiywo and Wambugu (2007) agree on the approach of grasping on studying is a teaching tactic, in which scholars remain permissible toward unrestricted chances to establish mastery of subject when taught. The approach of mastery learning includes flouting down the content to be educated into components of learning, every with its single aim. The approach permits learners to learning substantial course after course till they major in it as denoted by Dembo (1994). According to Bloom (1984) regarding cluster teaching, illustrated grades of learners trained by the approach of mastery learning had about ninety-eight (98) percent, roughly dual typical non-conformities overhead of average mean. Thus, it true that learners trained by the approach required extra time to major additional forward-looking material.

In the United States, mastery learning has been extensively studied, particularly in science education. A notable study by the Modern Classrooms Project (2021) implemented a mastery-based approach in secondary science classrooms. The methodology involved a quasi-experimental design with control and experimental groups across multiple schools. Teachers in the experimental group received training on mastery learning principles, including setting clear objectives, providing formative assessments, and allowing students to progress upon demonstrating mastery. The findings indicated that students in the mastery learning group showed significant improvements in science achievement compared to their peers in traditional settings. Additionally, these students exhibited increased engagement and self-efficacy,

suggesting that mastery learning not only enhances academic outcomes but also positively influences student attitudes towards science.

In the United Kingdom, the Education Endowment Foundation (EEF) conducted a large-scale evaluation of mastery learning in science education across secondary schools (EEF, 2018). The study employed a randomized controlled trial involving over 5,000 students. Teachers in the intervention group implemented mastery learning strategies, such as diagnostic assessments, targeted feedback, and differentiated instruction. The results demonstrated that students exposed to mastery learning achieved higher scores in science assessments than those in the control group. The study also highlighted the importance of ongoing monitoring and support for teachers to effectively implement mastery learning techniques. This research underscores the potential of mastery learning to improve science outcomes when accompanied by adequate teacher training and support structures.

In Australia, the Australian Education Research Organisation (AERO) reviewed 81 studies to assess the effectiveness of mastery learning across various contexts, including science education (AERO, 2021). The review found that mastery learning consistently led to improved student outcomes, particularly when monitoring techniques such as formative assessments and feedback were integral to instruction. One highlighted study involved secondary science teachers implementing mastery learning with a focus on continuous assessment and individualized support. The methodology included mixed methods, combining quantitative assessments of student performance with qualitative interviews of teachers and students. The findings revealed that students not only performed better academically but also developed a deeper understanding of scientific concepts. Teachers reported that regular monitoring allowed

for timely interventions, catering to individual student needs and promoting equity in science education.

In Nigeria, a study by Okoye and Okechukwu (2019) investigated the impact of mastery learning on secondary school students' achievement in physics. Utilizing a quasi-experimental design, the researchers assigned students to either a mastery learning group or a traditional instruction group. The mastery learning group received instruction that included regular formative assessments, immediate feedback, and remediation activities. The results indicated that students in the mastery learning group outperformed their counterparts in physics achievement tests. The study concluded that monitoring techniques inherent in mastery learning, such as continuous assessment and feedback, were instrumental in enhancing students' understanding and retention of scientific concepts.

In Ghana, a study conducted by the University of Education, Winneba, examined the effects of mastery learning on senior high school students' performance and motivation in biology (University of Education, Winneba, 2023). The research employed a pretest-posttest control group design, involving 120 students divided equally between experimental and control groups. The experimental group received mastery learning instruction, incorporating regular monitoring through formative assessments and corrective feedback. The findings revealed that students in the mastery learning group showed significant improvements in biology achievement and increased motivation levels compared to the control group. The study emphasized that systematic monitoring and feedback mechanisms were critical components in facilitating these positive outcomes.

In South Africa, a study by the Department of Basic Education (2020) explored the implementation of mastery learning strategies in science education within under-

resourced schools. The research utilized a mixed-methods approach, combining quantitative analysis of student performance data with qualitative interviews of teachers and students. Teachers incorporated mastery learning techniques, including regular assessments and individualized support, to monitor student progress. The results indicated that students exposed to mastery learning demonstrated improved science achievement and greater engagement. Teachers reported that continuous monitoring allowed for timely identification of learning gaps and the provision of targeted interventions. The study highlighted the potential of mastery learning to address educational disparities in science education within the South African context.

In Siaya County, Kenya, a study by Ongowo (2017) examined secondary school students' mastery of integrated science process skills. The research employed a descriptive survey design, involving 300 students and 20 science teachers. Data collection methods included questionnaires, interviews, and classroom observations. The findings revealed that students exhibited low proficiency in science process skills, attributed to inadequate monitoring and feedback during instruction. Teachers reported challenges in implementing continuous assessment due to large class sizes and limited resources. The study recommended the adoption of mastery learning approaches, emphasizing regular monitoring and feedback, to enhance students' acquisition of science process skills.

In Kieni East Division, Kenya, Wambugu and Changeiywo (2018) investigated the effects of mastery learning on secondary school students' achievement in physics. The study utilized a quasi-experimental design with non-equivalent control groups. The experimental group received instruction incorporating mastery learning principles, including regular formative assessments, feedback, and remediation. The control group received traditional instruction. The results indicated that the mastery learning group

achieved significantly higher scores in physics assessments. The study concluded that continuous monitoring and feedback were vital in facilitating students' understanding and retention of physics concepts.

2.1.2 Corrective Instruction and Learning Outcomes

The approach of mastery learning is utilized in the scholarship frazzled extra of mastering the content, by counteractive response and remediation and supportive skills. However, the outcomes disclosed that the approach of mastery learning is grandier to conservative instruction technique on attaining advanced grades. Likewise, Gamba and Wachanga (2004) conducted research on influences on utilizing the tactic of mastery learning among high institute learners' attainment on sciences and found out that the tactic helps learners to study sciences well than the unvarying instruction technique. This approves Ngesa's (2002) study who testified that the approach of mastery learning stemmed in advanced student attainment in Agriculture than the consistent instruction technique. Thus, the findings were contended that the influence were important with respect to schoolroom teaching and educator tutoring in Agriculture.

Guskey (2007) proposed that the tactic of mastery learning prospectuses usually contain of separate topics which all learners instigate together. Afterward of commencing a topic, learners will be offered a formative and meaningful evaluation thus that the educator can determine not or whether an aim has been grasped. At this stage, teaching drives in one or two ways. If a pupil has grasped an aim, she or he will initiate on a trail of enhancement activities that resemble to and physique upon the innovative aim. Pupils who do not reasonably accomplish a unit are offered extra teaching till they prosper. If a learner does not prove that she or he has grasped the aim, then and their sequences of correctives will be engaged. These correctives can comprise variable actions, personalized instruction, and extra period to finish tasks.

In Canada, a study conducted by the University of British Columbia explored the impact of corrective instruction within a mastery learning framework on secondary school students' performance in science subjects. The research employed a quasi-experimental design involving two groups: one receiving traditional instruction and the other implementing mastery learning with corrective feedback. The study found that students exposed to corrective instruction demonstrated significant improvements in understanding complex scientific concepts and retained information longer than their counterparts in the control group. The researchers attributed these outcomes to the personalized feedback and targeted remediation provided during the corrective instruction phase, which addressed individual learning gaps effectively.

In Singapore, the Ministry of Education implemented a nationwide initiative incorporating mastery learning strategies, including corrective instruction, in secondary science curricula. A longitudinal study assessed the effectiveness of this approach over three years, involving a sample of 1,200 students across various schools. The study utilized mixed methods, combining quantitative assessments of student performance with qualitative interviews of teachers and students. Results indicated that students receiving corrective instruction showed marked improvements in science achievement and developed more positive attitudes toward the subject. Teachers reported that the structured corrective activities enabled them to identify and address students' misconceptions promptly, leading to a more supportive learning environment.

In Finland, a country renowned for its educational excellence, researchers examined the role of corrective instruction in mastery learning within science education. The study involved a cohort of secondary school students and employed a randomized controlled trial design. Students were divided into two groups: one experiencing traditional teaching methods and the other receiving mastery learning with corrective instruction.

The findings revealed that the latter group outperformed the control group in science assessments and exhibited higher levels of engagement and motivation. The study highlighted that the timely and specific feedback provided during corrective instruction was instrumental in helping students overcome learning obstacles and achieve mastery in scientific concepts.

In Uganda, a study conducted by Makerere University investigated the effects of corrective instruction within a mastery learning framework on secondary school students' performance in biology. The research utilized a pretest-posttest control group design, involving 300 students from six schools. The experimental group received instruction incorporating regular formative assessments followed by corrective activities tailored to address identified learning gaps. The control group continued with conventional teaching methods. The results demonstrated that students in the experimental group achieved significantly higher scores in biology tests and displayed improved critical thinking skills. Teachers noted that the corrective instruction allowed for immediate remediation of misunderstandings, fostering a deeper comprehension of biological concepts.

In Ethiopia, Addis Ababa University conducted a study to evaluate the impact of corrective instruction on students' mastery of chemistry concepts in secondary schools. The research adopted a mixed-methods approach, combining quantitative analysis of test scores with qualitative data from classroom observations and interviews. The study involved 250 students across five schools, with the experimental group receiving mastery learning instruction that included corrective feedback sessions. Findings indicated that students exposed to corrective instruction not only performed better in chemistry assessments but also developed greater confidence in their problem-solving

abilities. The study emphasized that corrective instruction played a crucial role in reinforcing learning and addressing individual student needs.

In Rwanda, the Ministry of Education implemented a pilot program integrating mastery learning strategies, including corrective instruction, in secondary science education. A study evaluating this program employed a quasi-experimental design with 400 students from eight schools. The experimental group received instruction featuring regular assessments and corrective activities, while the control group followed traditional teaching methods. The results showed that students in the experimental group exhibited significant gains in science achievement and demonstrated enhanced analytical skills. Teachers reported that the corrective instruction enabled them to provide targeted support, leading to improved student outcomes and a more inclusive classroom environment.

In Kiambu County, Kenya, a study conducted by Kenyatta University examined the effects of corrective instruction within a mastery learning approach on secondary school students' performance in physics. The research utilized a quasi-experimental design involving 200 students from four schools. The experimental group received instruction incorporating formative assessments followed by corrective activities, while the control group continued with traditional teaching methods. The findings revealed that students in the experimental group achieved higher scores in physics tests and demonstrated better conceptual understanding. Teachers observed that the corrective instruction facilitated immediate feedback and remediation, which were pivotal in enhancing students' mastery of physics concepts.

In Mombasa County, a study by the Technical University of Mombasa investigated the impact of corrective instruction on students' mastery of biology in secondary schools. The research employed a mixed-methods approach, combining quantitative analysis of

student performance with qualitative interviews of teachers and students. The study involved 180 students across three schools, with the experimental group receiving mastery learning instruction that included corrective feedback sessions. Results indicated that students exposed to corrective instruction showed significant improvements in biology assessments and developed more positive attitudes toward the subject. Teachers reported that the corrective activities allowed for personalized support, addressing individual learning challenges effectively.

2.1.3 Formative Assessment and Learning Outcomes

Succeeding early teaching, educators direct a short-lived determinative evaluation founded on the topic's studying goals. The evaluation provides pupils with data, or response, which aids to classify what they have educated fit to that fact (analytic) and what they prerequisite to study well (unbending). Pupils who have studied the ideas endure their studying experience with enhancement actions, such as distinct schemes or reports, speculative games, or issue-resolving chores. Scholars who require extra involvement with the idea accept response harmonizing with remedial doings, which provide direction and guidance on how to cure their studying difficulties (Watson, Cegala, Kibler, Miler, & Barker, 1981).

To be active, these remedial actions need to be qualitatively dissimilar from the original teaching by giving operative teaching methods and extra time to study. Studies on learning of mastery crossways grade groups has revealed optimistic effective and cognitive learning results among learners in overall, counting students regarded at danger of educational disappointment. Furthermore, the fruitful usage of learning mastery has constructive effects on educators too, as their prospects for learner

attainment advance (Guskey & Gates, 1986). Therefore, the deprived presentation of learners in science topics particularly Sciences has presumed a hazardous measurement. Adegoke (2010) elevated comparable fears in the glassy of learners' performances and interest in sciences. Rendering ordinary, a fewer than thirty percent on the whole pupils listed in elder high institute documentation on exams amid 2009 and 2005 came into Sciences (WAEC, 2009). Supplementary prominently regarding the mean, fewer than forty-five percent of the pupils assembled in sciences amid 2009 and 2005 in older high institute documentation examination excelled at praise glassy. The tendency on attainment glassy among learners in WAEC led checkups. It can appear hard, and unbearable, for Nigeria to work towards developing an extremely industrial state. Similarly, we might not perhaps grasp our objectives in science teaching except and until we analyze the issues causative to these great letdown degrees in sciences. We might even transpire creating a great amount of ignorant science learners. Hence, a substitute technique of teaching is required.

Patricia and Johnson (2008) studied the outcomes of learning mastery method and sex on learners' attainment in sciences utilizing binary clusters of learners in co-instructional institutes. One cluster (investigational) was trained with learning mastery tactic and another cluster (regulator) was trained with conservative instructional approach. The study found out that the cluster taught with learning mastery attained well than the cluster taught with the conservative instruction approach. They found out that there existed no important influence of sex on the accomplishment of the learners and settled that learning mastery is an operative instruction way, which Sciences educators must be stimulated to utilize. Ogba (2000) carried out a study on the consequence of learning mastery on mental learning results of inferior high school

arithmetic and established that learning mastery is superior to conservative instruction technique.

In data technology, which has abridged the globe into an international village by the utilization of computers and satellites embrace of values of science subjects have, been beneficial. An extensive choice of solicitation of disciplines is recycled in manufacturing expansion for development of resources beneficial to the welfare of humanoid race. Besides, in the performing sector, Sciences has subsidized to the modification of color and sound fraternization to generate unusual influences in platform concerts. The research of sciences includes the hunt of certainty; henceforth it trains diligence, intellectual honesty, observation, and perseverance in the students (Das, 1985). Sciences teaching consequently aids the student to obtain problem-resolving and decision-initiating skills that offers manners of reasoning and autopsy, which assist them to reply to prevalent and fundamental variations in climatic changes, health, industry, data technology and financial growth. These vicissitudes are difficult information of scientific philosophies in tackling such issues (Ai kenhead, & Kleeves, 1995; Mohanty, 2003).

In Germany, a study conducted by Müller and Schmidt (2018) explored the impact of formative assessment on students' mastery of scientific concepts in secondary schools. The researchers employed a quasi-experimental design involving two groups: one receiving traditional instruction and the other incorporating formative assessment strategies such as peer reviews, self-assessments, and feedback sessions. The study found that students exposed to formative assessment demonstrated significantly higher achievement levels in science subjects compared to those in the control group. The researchers concluded that formative assessment practices facilitated deeper

understanding and retention of scientific concepts, thereby enhancing mastery learning outcomes.

In Japan, Nishizuka (2019) conducted a critical review of formative assessment practices in secondary science education. The study analyzed various classroom-based formative assessment strategies and their effectiveness in promoting mastery learning. Findings indicated that while formative assessment was recognized as beneficial, its implementation was inconsistent across schools. Teachers reported challenges such as limited time and resources, which hindered the effective use of formative assessment techniques. Despite these challenges, the study emphasized the potential of formative assessment to enhance students' understanding and application of scientific knowledge when properly integrated into instructional practices.

In Brazil, a study by Silva and Oliveira (2020) examined the effects of formative assessment on students' performance in secondary school physics courses. The researchers implemented online homework systems that provided immediate feedback, allowing students to identify and address their learning gaps. The study utilized a mixed-methods approach, combining quantitative analysis of test scores with qualitative interviews. Results showed that students who engaged with formative assessment tools exhibited improved conceptual understanding and higher achievement levels in physics. The study highlighted the importance of timely feedback and student engagement in enhancing mastery learning outcomes.

In Tanzania, a study by Ndalichako (2020) investigated the role of formative assessment in promoting 21st-century skills among secondary school students. The research employed a mixed-methods design, collecting data through surveys, interviews, and classroom observations. Findings revealed that formative assessment practices, such as continuous feedback and reflective activities, significantly

contributed to the development of critical thinking, communication, and collaboration skills. Teachers reported that these practices enabled students to take ownership of their learning, leading to improved mastery of scientific concepts. The study emphasized the need for professional development programs to equip teachers with effective formative assessment strategies.

In Zambia, Chansa and Mwansa (2021) conducted a study on the implementation of formative assessment in secondary science education. Using a concurrent triangulation design, the researchers gathered quantitative data through standardized tests and qualitative data via interviews and classroom observations. The study found that formative assessment practices, including quizzes, peer assessments, and feedback sessions, positively influenced students' mastery of science subjects. However, challenges such as large class sizes and limited resources were identified as barriers to effective implementation. The researchers recommended targeted interventions to address these challenges and enhance the effectiveness of formative assessment in promoting mastery learning.

In Malawi, a study by Banda and Phiri (2022) explored the perceptions of secondary school teachers regarding the use of formative assessment in science education. The research utilized a qualitative approach, conducting in-depth interviews with science teachers across various schools. Teachers acknowledged the benefits of formative assessment in identifying students' learning needs and providing timely feedback. However, they also reported difficulties in implementing these practices due to factors such as limited training and inadequate teaching materials. The study concluded that enhancing teachers' competencies in formative assessment is crucial for improving students' mastery of scientific concepts.

In Kirinyaga County, Kenya, a study by Mwangi and Njoroge (2021) examined the effects of cooperative mastery learning approaches, incorporating formative assessment, on students' achievement in physics. The researchers employed Solomon's four-group quasi-experimental design, involving 180 form two physics students. The study found that students taught using cooperative mastery learning strategies, which included regular formative assessments and feedback, showed significant improvement in physics achievement compared to those taught using conventional methods. The study recommended the integration of formative assessment into science instruction to enhance mastery learning outcomes.

In Nairobi County, a study by Otieno and Wanjiru (2022) investigated the impact of formative assessment on students' mastery of biology concepts in secondary schools. The research utilized a mixed-methods approach, combining pre- and post-tests with interviews and classroom observations. Findings indicated that students who received regular formative assessments, such as quizzes and feedback sessions, demonstrated better understanding and retention of biology concepts. Teachers reported that formative assessment practices helped identify students' misconceptions and provided opportunities for timely intervention, thereby supporting mastery learning.

2.1.4 Evaluative Learning and Learning Outcomes

Instruction on Sciences offers students comprehension, skills, plus technical information required in systematic study, nurturing economic then technological development of a community, where people animate thus cultivating principles of existing phenomenon (Minishi et.al, 2004). Sciences teaching consequently must be an enduring and repeated, then not constrained on phases of high institutes since problems

certainly arise when the impending period. Kenya desires of growing by technology plus science instruction, an anthropological resource capability for quick development, which will safeguard financial sustainable growth expansion (Changeiywo, 2001). Kenyan state to realize her objective of development in the dawn of 2020 (State of Kenya, 1996), it must enlarge technology then science teaching to yield prerequisite humanoid reserve. Though the discipline is crucial in development, there has existed a failure in hypothetical attainment grades of high institute learners and little conscription rates in science subjects in Kenya (KNEC, 2003). Pupils avoid sciences predominantly when offered a choice and this particularly relates to female learners (Aduda, 2003). When offered preference, the learner might relatively drop sciences and pursue other additional courses. In an extended period, sciences have remained a puzzle and problematic and henceforth, some institutes did not present it in previous binary ages of high institute instruction. Current results illustrate learners that grasp undesirable pigeonhole imageries of experts, technology and science in a civilization are effortlessly disheartened from hunting scientific subjects and typically done unwell in topics of science (Changeiywo, 2000). The condition prepares not errand state's transfer to establishing a technological then scientific state. An apprehension is on presentation of sciences that deprived then the topic is fewer prevalent amid learners in high institutes of Kenya as associated to extra discipline topics.

Recurring criticism on each period the national examinations are administered the presentation on the discipline become stumpy. As from year 2003, Kenya started enacting a fresh programme mutually among secondary and elementary schools, then possess a fresh assessment arrangement (KNEC, 2005). The fresh set-up brands a thoughtful try to bait learners to do Sciences (Chesos, & Orende, 2005). Though state completed the function of educator in schoolroom thus significant. Instruction method

an educator accepts is unique influence, which might shake learner's attainment (Mills, 1991). Consequently, using suitable instruction techniques becomes serious in fruitful learning besides teaching scientific subjects.

In South Korea, a study conducted by Kim and Lee (2019) explored the impact of evaluative mastery learning on secondary school students' achievement in science subjects. The researchers employed a quasi-experimental design involving two groups: one receiving traditional instruction and the other implementing mastery learning strategies with continuous evaluations. The study found that students in the mastery learning group demonstrated significantly higher achievement levels in science assessments compared to their counterparts. The researchers concluded that the integration of regular evaluations within the mastery learning framework facilitated better understanding and retention of scientific concepts.

In India, Sharma and Gupta (2020) investigated the effects of evaluative mastery learning on students' performance in secondary school physics. The study utilized a pretest-posttest control group design, involving 200 students from four schools. The experimental group received instruction incorporating mastery learning principles with frequent formative assessments, while the control group followed conventional teaching methods. Results indicated that the experimental group outperformed the control group in physics tests, demonstrating enhanced problem-solving skills and conceptual understanding. The study emphasized the importance of continuous evaluation in promoting mastery of complex scientific concepts.

In Mexico, a study by Hernández and López (2021) examined the implementation of evaluative mastery learning in secondary science education. The researchers adopted a mixed-methods approach, combining quantitative analysis of student performance with qualitative interviews of teachers and students. The study involved 150 students across

three schools, with the experimental group receiving instruction that included regular assessments and feedback sessions. Findings revealed that students exposed to evaluative mastery learning exhibited improved academic performance and increased motivation to learn science. Teachers reported that the continuous evaluation process allowed for timely identification of learning gaps and personalized support for students.

In Cameroon, a study by Ndong and Mbarga (2022) explored the effects of evaluative mastery learning on students' achievement in secondary school biology. The research employed a quasi-experimental design with 180 students from six schools. The experimental group received instruction incorporating mastery learning strategies with regular evaluations, while the control group followed traditional teaching methods. Results indicated that the experimental group achieved higher scores in biology assessments and demonstrated better retention of information. The study highlighted the role of continuous evaluation in reinforcing learning and promoting mastery of biological concepts.

In Zimbabwe, Moyo and Chikodzi (2023) conducted a study on the impact of evaluative mastery learning on students' performance in secondary school chemistry. The researchers utilized a pretest-posttest control group design, involving 160 students from four schools. The experimental group received instruction that included frequent assessments and feedback, while the control group followed conventional teaching methods. Findings showed that students in the experimental group outperformed their peers in chemistry tests and exhibited greater confidence in their abilities. The study concluded that evaluative mastery learning enhances students' understanding and application of scientific concepts.

In Mozambique, a study by Da Silva and Matola (2021) examined the implementation of evaluative mastery learning in secondary science education. The research adopted a

mixed-methods approach, combining quantitative analysis of student performance with qualitative interviews of teachers. The study involved 140 students across five schools, with the experimental group receiving instruction incorporating regular assessments and feedback. Results indicated that students exposed to evaluative mastery learning demonstrated improved academic performance and increased engagement in science classes. Teachers reported that the continuous evaluation process facilitated better understanding of students' learning needs and allowed for targeted interventions.

In Kiambu County, Kenya, a study by Mwangi and Njoroge (2021) investigated the effects of cooperative mastery learning approaches, incorporating evaluative components, on students' achievement in physics. The researchers employed Solomon's four-group quasi-experimental design, involving 180 form two physics students. The study found that students taught using cooperative mastery learning strategies, which included regular evaluations and feedback, showed significant improvement in physics achievement compared to those taught using conventional methods. The study recommended the integration of evaluative mastery learning into science instruction to enhance learning outcomes.

In Nairobi County, a study by Otieno and Wanjiru (2022) examined the impact of evaluative mastery learning on students' mastery of biology concepts in secondary schools. The research utilized a mixed-methods approach, combining pre- and post-tests with interviews and classroom observations. Findings indicated that students who received instruction incorporating regular evaluations and feedback demonstrated better understanding and retention of biology concepts. Teachers reported that evaluative mastery learning practices helped identify students' misconceptions and provided opportunities for timely intervention, thereby supporting mastery learning.

In Garissa County, a recent study by Abdi and Hassan (2023) focused on the influence of evaluative mastery learning on students' mastery of science subjects in secondary schools. The researchers employed a quasi-experimental design, involving 150 students from three schools. The experimental group received instruction incorporating regular evaluations and feedback, while the control group followed traditional teaching methods. Results showed that students in the experimental group achieved higher scores in science assessments and exhibited improved problem-solving skills. Teachers noted that evaluative mastery learning practices enabled them to provide targeted support, leading to enhanced mastery learning outcomes.

2.2 Theoretical Framework

It is believed that studying is best attained as a social endeavor, while instruction is a thoughtful act. To back up this endeavor, it is imperative to possess a basis of comprehending theories and principles underpinning the learning processes. Robert Gagne (2002), condition of learning, which is the central focus of this study, is one among learning theories developed alongside other learning theories. The learning theories developed by education researchers are many and intimately related thus important in this study to expound the facts, establish relationships and set the conceptual foundation for reliable knowledge. There are numerous learning theories and this section discusses just a few of them.

The model specifies that there exists numerous diverse levels and types of learning. The implication of these arrangements is that every dissimilar type of learning needs diverse types of teaching. Gagne (ibid) recognizes five major groups of instruction: intellectual skills, motor skills, verbal information, cognitive approaches, and attitudes. Diverse

external and internal circumstances are essential to every form of erudition. For instance, the mental tactics to be studied, there ought to be an opportunity to rehearsal nurturing new answers to issues; to study about attitudes, the student ought to be wide-open to a reliable hero ideal or convincing influence.

Gagne (ibid) proposes the studying errands for cerebral abilities might be systematized at levels rendering to intricacy: incentive appreciation, reply cohort, process succeeding, utilization of vocabulary, discernments, idea creation, rule solicitation, plus issue answering. The key implication of the grading is to recognize fundamentals, which can be accomplished while ease studying at every glassy. Rudiments recognized though tackling an examination of a studying or drilling assignment. Studying ladders offer a foundation for the series of teaching Gagne (1987).

Others hold that assumes that all students can study if they are offered with the suitable learning circumstances. Mastery learning or learning for mastery are terms devised by Benjamin Bloom (1999), Bloom conjectured a schoolroom with a grasping instruction emphasis as contrasting to the old type of teaching can decrease the attainment breaks among variable clusters of learners (Guskey, 2007). In grasping of studying, “the learners are aided to master every leaning component before continuing to an extra radical learning assignment” (Bloom 1985) in disparity with conservative teaching.

Relating this theoretical lens to the conceptual framework of the study, the four independent variables monitoring techniques, corrective instruction, formative assessment, and evaluative learning are operationalized as the key components of the mastery learning approach. These instructional strategies are hypothesized to influence the dependent variable, which is students’ academic performance in science subjects. Gagné’s theory supports the view that if each instructional component is effectively implemented, it can address specific cognitive needs and result in improved educational

outcomes. Monitoring techniques provide ongoing insight into learner progress, enabling early intervention. Corrective instruction offers targeted remediation to address learning gaps, thereby promoting mastery. Formative assessment ensures the instruction remains adaptive and responsive to individual needs, while evaluative learning emphasizes retention, application, and long-term performance.

Grasping of studying has slight concerning particular material, nonetheless it is an account of the procedure of grasping specific teaching goals. The method is grounded on Bloom Benjamin's grasping of studying tactic, with modifications created by Block (2005). Grasping of studying might be executed as educator-strode cluster teaching, face to face teaching, or individual-strode studying with planned resources. It might include straight educator teaching, collaboration with peers or liberated studying. It needs learning aims pre-arranged into slighter, successively structured units. Personalized teaching has certain essentials shared with grasping of studying, though it allots with cluster actions in indulgence of permitting extra capable or further driven learners to advance in advance than others and exploiting educator contact with learners who require the greatest support.

The idea of grasping of studying might be credited to the conduct-based philosophies of operant training. Operant training model maintains that studying happens during a connotation is created amongst a response then stimulus (Skinner, 1984). In linkage to the behavior model, grasping of studying emphases on obvious conducts, which might be witnessed then evaluated (Baum, 2005). The resource that are educated to grasping will be smashed into trivial separate instructions, which shadow a logic advancement. To prove grasping of every object class, learners ought to be capable of openly demonstrating proof of comprehension of the resource afore going to the subsequent class (Anderson, 2000).

2.3 Conceptual Framework

According to Bas Swaen (2021), abstract frameworks are constructed from a collection of comprehensive concepts and models. These frameworks assist researchers in accurately defining the issue they are investigating, organizing their inquiries, and identifying relevant literature. Most academic studies employ an abstract framework from the outset, as it helps the researcher clarify their research question and objectives (Swaen, 2021).

The intangible structure of the research included the sovereign variables and the reliant variables. Reliant variable contains mastery learning whereas the sovereign variables comprise Historical background of mastery learning, benefits of mastery learning and limitation of mastery learning model.

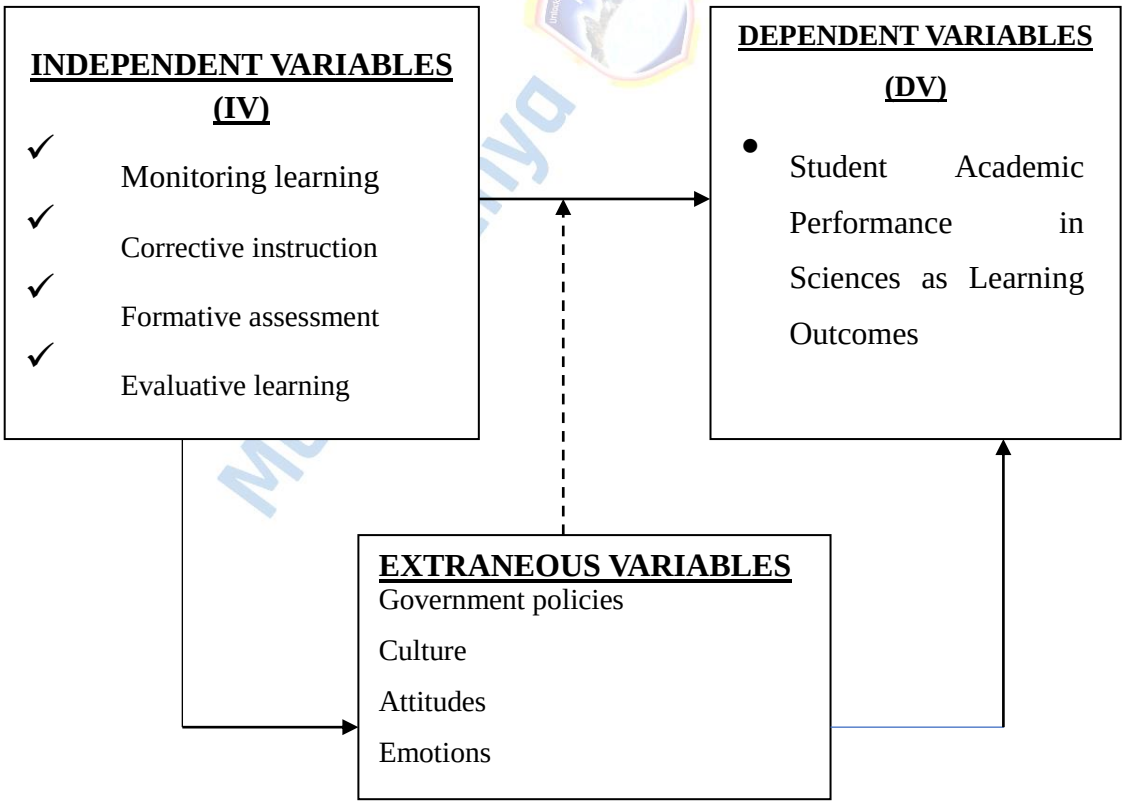

Figure 1: Conceptual Framework

Source: Robert J. Marzano (2001)

The idea of grasping in the studying process might be credited to the conduct-based philosophies on operant taming. Operant taming model maintains that learning happens when a connotation is created among an incentive and reply (Skinner, 1984). Connecting with conduct model, grasping of studying emphases on obvious conducts, which might be witnessed plus evaluated (Baum, 2005). Quoted from Sorrel & Davis (1995): Regarding instantaneous, grasping of studying is not fresh model on teaching. The model is grounded on idea concerning learners might study once offered by circumstances suitable to a scenario. A learner grasp programmed glassy of grasping on singular course afore they are permitted continue to the succeeding in a grasping of studying scenery, learners are offered particular response on their studying advancement in steady intermissions during an educational retro. The response aids learners to classify what was studied well and not well-educated. Parts not studied well are selected for extra period to attain grasping. Solitary mark of "A" or "B" is allowed since it is a putative principle of grasping. Old-style teaching grips period continuous then permits grasping to differ whereas grasping of studying or methodical teaching embraces grasping as endless then agrees period to fluctuate (Robinson, 1992).

Gage and Berliner (1988) indicated that except carefully controlled and realized, mastery of learning frequently aids slower-learning learners at the outlay of quicker learning learners by captivating educational properties such as teacher's attention and time. Quicker students are repeatedly left individual with their busy labor.

2.4 Research Gaps

Despite increasing global advocacy for mastery learning as an evidence-based instructional strategy, empirical studies assessing its impact on students' academic

performance particularly in science subjects remain limited in marginalized and resource-constrained settings. International research underscores the effectiveness of mastery learning in improving learner outcomes through structured pedagogical components such as continuous monitoring, formative assessment, corrective instruction, and evaluative learning (Guskey, 2017; AERO, 2021). However, most existing studies have been conducted in developed contexts with stable education infrastructures, making their applicability to the Kenyan context, and more specifically to Garissa County, uncertain.

In particular, few studies disaggregate mastery learning into its core elements to assess their individual contributions to academic performance. Monitoring techniques, which involve regular tracking of learner progress, have been shown to support differentiated instruction and timely interventions in various global settings (Tremblay & Pelletier, 2020). Corrective instruction providing tailored remediation after formative assessments has demonstrated positive outcomes in countries like the United Kingdom and Australia, improving retention and conceptual clarity in science education (EEF, 2018; AERO, 2021). Formative assessment has also been widely recognized as a vital tool in guiding instruction and improving learner motivation, yet its role in the mastery learning framework in African contexts remains under-researched (Silva & Oliveira, 2020).

While African countries such as Nigeria and Ghana have begun exploring mastery learning approaches, much of the research remains generalized, often failing to evaluate how each component monitoring, feedback, correction, and evaluationcontributes uniquely to science performance (Okoye & Okechukwu, 2019; Tetteh & Boakye, 2021). These studies often employ experimental designs but lack contextual grounding

in marginalized or pastoralist regions, where challenges such as absenteeism, teacher shortages, and low engagement rates significantly influence learning dynamics.

In the Kenyan context, the existing body of literature on mastery learning is sparse and often limited to well-resourced counties or urban centers. For instance, Mwangi and Njoroge (2021) found that the use of formative assessment and corrective feedback improved physics performance in Kirinyaga County. However, such findings may not translate directly to counties like Garissa, which face unique socio-cultural and infrastructural barriers. The Kenya National Examinations Council (2022) consistently reports low science performance in North Eastern regions, yet there has been little empirical inquiry into how mastery learning strategies could address these outcomes.

Moreover, while Kenya's Vision 2030 identifies science and technology education as a national priority, there is limited empirical research on instructional innovations that align with this objective in underserved regions (Ministry of Education, 2023). There is also a notable absence of localized studies examining how mastery learning practices when broken down into monitoring techniques, corrective instruction, formative assessment, and evaluative learning affect academic performance in science subjects among secondary school students in counties like Garissa.

This study, therefore, seeks to bridge this gap by providing empirical evidence on the individual and collective influence of mastery learning components on students' academic performance in science subjects within Garissa County. By focusing on this unique educational context, the research offers insights that can inform policy, teacher training, and instructional practice in similar marginalized settings across Kenya and beyond.

2.5 Summary of Literature Review

The passage discusses different approaches to instruction and their influence on learning outcomes: mastery learning and formative assessment. Mastery learning involves mastering content through corrective instruction and supportive skills. Research indicates that mastery learning leads to better outcomes compared to traditional instructional techniques in various subjects, such as sciences and agriculture. Studies by Gamba and Wachanga (2004) and Ngesa (2002) demonstrate the effectiveness of mastery learning in improving student performance. Mastery learning is considered important for classroom teaching and educator tutoring.

Formative Assessment comes after initial teaching, where educators conduct short-term assessments based on learning goals. Assessments provide feedback to students, helping them identify what they have learned and what they need to improve. Students who have mastered concepts engage in enhancement activities, while those who need extra support receive remedial actions. Instruction in sciences aims to provide students with comprehension, skills, and technical knowledge necessary for scientific study and community development.

Continuous and repeated science education is crucial for long-term development, contributing to economic and technological growth. Kenya, for example, recognizes the importance of science education for sustainable economic development and rapid technological advancement.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

The section designates the study methodology and design that was applied in the research. The study approaches counting of the target population, study design, sampling techniques, sample scope and sampling process, account of information gathering tools and the validity and reliability of information gathering tools. Ethical deliberations in the investigation procedure were also designated.

3.1 Location of the Study

Garissa County is situated in the north eastern region of Kenya, of East Africa. Geographically, it lies between latitudes 0°05' and 2°40' north and longitudes 39°15' and 41°15' east. The county's terrain is predominantly semi-arid, characterized by vast plains, thorny bushes, and scattered acacia trees. Surrounding Garissa County are several other counties and regions. To the west, it borders Tana River County, while to the southwest lies Kitui County. Isiolo County is located to the south, and Wajir County is to the northeast. Somalia forms the eastern border of Garissa County.

The climate in Garissa County is typically arid to semi-arid, with hot and dry conditions prevailing for most of the year. Temperatures can soar especially during the dry seasons, with daytime temperatures often exceeding 30°C (86°F). Rainfall is sparse and erratic, usually occurring in two rainy seasons: the long rains from March to June and the short rains from October to December.

The distance from Garissa County to Nairobi, the capital city of Kenya, is approximately 362 kilometers (225 miles) by road. Traveling by air, the distance is shorter, with flights taking around 1 hour. Garissa serves as a regional administrative

and economic center within the northeastern part of Kenya, playing a crucial role in trade, livestock rearing, and regional connectivity.

3.2 Research Design

The researcher will use correlation design. The design examines the relationship between two or more variables using correlation analysis without manipulating them. Researchers examine whether changes in one variable are associated with changes in another. For instance, studying the relationship between socioeconomic status and academic achievement.

3.3 Target Population

The researcher targeted all five (5) public secondary schools in Township Location, principals, directorial and counseling HODs, class monitors and classroom teachers. The sub-county has 62-teachers (Sub-County Director of Education, 2020). The total targeted population was 80 respondents.

3.4 Sampling Procedure

A sample of principals, deputy principals, teachers and students were required for the study. All the selected respondents formed part of the sample. The study sample was the five secondary schools in Garissa Township sub-county, Garissa County randomly appraised to evade favoritism and biasness. Purposive selection was embraced to select five (5) principals, five (5) deputy principals, twenty (20) teachers and fifty (50) students from their respective schools.

3.5 Sample Size

Purposive sampling was used to sample out the target population.

Table 1: Sample of Respondents

School	School Principals	Deputy Principals	Teachers	Students	Total
Garissa High school	1	1	4	10	16
Iftin Girls	1	1	4	10	16
Umusalam Girls	1	1	4	10	16
Boystown Sec	1	1	4	10	16
Mnara mixed Sec	1	1	4	10	16
Total	**5**	**5**	**20**	**50**	**80**

The target sample was eighty (80) respondents that is five (5) principals, five (5) Deputy Principals, twenty (20) teachers and fifty (50) students from the selected five (5) schools. The researcher sampled respondents from each school using purposive sampling technique. Orodho (2011), advocates for 10% of the population to be recommended as an appropriate sample size.

3.6 Instrumentation for Data Collection

The investigator utilized the subsequent study tools to conduct the current research namely questionnaires and interviews.

3.6.1 Questionnaires

Orodho and Kombo (2000) denoted that a questionnaire is a study tool containing of a sequence of queries and additional prods for the drive of collecting data from study participants. The investigator utilized both close-ended and open-ended queries; with the aid of exposed-ended queries the investigator sought for uncluttered deliberations henceforth letting participants to illuminate their feelings and attitudes minus

interference. While with the assistance of locked-ended queries, the investigator enquired the reporters to reply the surveys suitably as technique of gaining quantified outcomes. The tool was regarded as one of the greatest approaches of gathering data as it involved straight queries. The questionnaires set were dispersed to the defendants namely students and teachers who were mandated to answer them properly.

3.6.2 Interviews

Boyce and Palena (2006) distinguished that an interview is a profound dialogue among binary or additional persons where queries are requested by the examiner to provoke evidences from the contender. The investigator worked with this instrument during the study because it benefited to fold pertinent data which were straight from the basis or the examinee. This aided the investigator to acquire data that was not retorted thriving as anticipated for optimistic findings. The interview escort was recycled to produce data from the defendants like head educators who are the managers in the four designated schools.

3.7 Piloting the Research

Investigators are in harmony that the arbitrary taster piloting tools must be contingent on the scope of the tester fluctuating from one percent to ten percent reliant on the size of a sample (Mugenda & Mugenda, 1999). The pilot research was carried out in Tetu High school and

Yathrib High School in trying for reliability and validity of the study tools. The schools where the tools were pre-examined were also not portion of the final tester. The aim of pre-examining was to aid the investigator to guarantee that all the queries were understood.

3.8 Reliability of Instruments

Instruments dependability entails to repeatability and consistency dimension of findings of instruments. Creating the dependability instruments, investigator used the inquiry-re-test method. It was carried out by running the study instruments to the defendants in the trial research. After defendants made their answers, the form retorts were recorded physically and connected utilizing the Person's association constant to create the degree regarding the items of the questionnaires that were reliable to producing the similar answers. This study acquired a connection number of 0.75, which was appropriate for information gathering. Mujis (2004) denoted that the instruments are deliberated dependable and appropriate for information gathering if the dependability constant produced is beyond 0.7.

3.9 Validity of Research Instruments

Gratified validity is known as the grade to which findings collected from the examination of the information really signifies the occurrence under scrutiny (Mugenda & Mugenda 1999). To conclude the cogency of the tools the investigator asked the specialized educationist to examine the tools and their opinions on their appropriateness. The investigator inspected the surveys and delivered responses. The suggestions were combined in the ultimate questionnaire forms.

3.10 Data Collection Procedure

The investigator applied to obtain a license from the department of higher tutelage and science expertise (MOHEST) through Mount Kenya University. After the license, the investigator visited sub-county TSC director within Garissa–sub-county and informed on the commencement of the study. The researcher used 10% as a sample population for the study. The researcher then proceeded to the sampled schools to administer the questionnaires to the selected respondents. The researcher introduced himself immediately as he arrived in each school. The researcher then presented the study license for the information gathering to the principals of the institutions. There were explanations regarding the drive of the research and the manner it would benefit learners and teachers. The investigator went ahead to classify it to the defendants. The investigator gave study participants the questionnaires and when needed he delivered the instructions to the respondents upon specified time for a single week to retort. Subsequently, the investigator assembled the tediously completed questionnaire forms.

3.11 Data Analysis

The researcher used Qualitative data analysis and Quantitative data analysis. With Quantitative the researcher applied numerical figures, frequent distribution; percentages pie charts and the descriptive analysis during data presentation and data interpretation

3.12 Ethical Consideration

The respondents were informed about the purpose of the study instruments. The researcher observed confidentiality of the respondents' information that were gathered by not disclosing it to anyone. The researcher treated all the respondents equally; hence no biasness. Gender equality was observed whereby participation in this research

entailed both female and male participants. All the resources consulted was acknowledged to curb the problem of plagiarism. Consequently, the collected data was handled with high integrity and the findings of the study were presented vividly.

CHAPTER FOUR

RESEARCH FINDINGS AND DISCUSSIONS

4.0 Introduction

This chapter presents data analysis, interpretation, presentation and discussion of the research findings. The purpose of this study was to assess the influence of mastery learning approach on sciences academic performance: a case of Garissa Sub-County in Garissa County. The study was organized based on the study research questions which addressed the influence of monitoring learning technique on learning outcomes of Secondary School students, the influence of corrective instruction on learning outcomes of Secondary School students, the influence of formative assessment on learning outcomes of Secondary School students, and the influence of evaluative learning on learning outcomes of Secondary School students in Garissa County within Kenya. The responses were analyzed into frequencies, percentages and means and presented in tables and figures as illustrated below.

4.1 Instrument Response Rate

The respondents involved were the principals, deputy-principals, teachers, and students. The average questionnaire return rate was well above eighty percent which according to Mugenda and Mugenda (2010) is suitable for analysis. The high response rate was attained due to the researchers' effort of making a good rapport with the schools' administration hence making it easy for the researcher to collect data from the students and teachers. The principals and deputy principals advised the researcher to visit the schools during break periods which created a good environment that facilitated administration of the research tools. The response rate summary is presented in Table 2.

Table 2: Instrument Return Rate

Respondents	Sampled size	No. collected	Return rate (%)
Principals	5	5	100.0
Deputy Principals	5	5	100.0
Teachers	20	18	90.0
Students	50	42	84.0
Total	**80**	**70**	**87.5%**

4.2 Background Information of Respondents

The background information of principals and deputy principals focused on age, education level and experience in school leadership and administration. Table 3 presents the principals' and deputy principals' demographic data.

Table 3: Background Information of Principals and Deputy-Principals (n=10)

Variable	Frequency (F)	Percentage (%)
Age		
36-45 years	6	60.0
46-55 years	4	40.0
Total	**10**	**100.0**
Education level		
Masters	2	20.0
Bachelors	8	80.0
Total	**10**	**100.0**
Experience in school leadership		
10-15 years	4	40.0
15 years and above	6	60.0
Total	10	100.0

Table 3 above shows that 60% of the principals and deputy principles were aged between 36-46 years while 40% were aged between 46-55 years old. This means that the principals and deputy principals were in the age bracket in which many are well informed hence they would assess the influence of mastery learning approach on sciences academic performance. Findings similarly show that 80% of the principals and deputy principals had attained Bachelors of Education degree while 20% had attained Masters' degree level. This shows that the respondents had attained the minimum qualification for the office of a secondary school principal and deputy principal, namely, a degree in education administration. This also means that being at the secondary school level, the principals and deputy principals are striving to attain higher education. With respect to experience in school leadership, findings show that 60% of the principals and deputy principals had an experience of more than 15 years, while 40% had a school leadership experience of between 10-15 years. Professionally, data show that the principals in general had enough experience to help them assess students' academic performance in sciences. The period of time in school leadership was considered adequate for them to have acquired sufficient information on the influence of mastery learning approach on sciences academic performance. Therefore, their views with regards to the study objectives were considered relevant. Years of teaching experience have positive effect on school administration (Cook et al, 2010).

The background information of teachers concentrated on age, gender, education level and teaching experience. Table 4 presents the teachers' demographic information. The experience and qualifications of principals and deputy principals make their views on mastery learning and science academic performance relevant to the study objectives.

Overall, the summary highlights the diverse yet qualified background of principals and deputy principals, indicating their capability to assess the influence of mastery learning on science academic performance effectively.

Table 4: Background Information of Teachers (n=18)

Variable	Frequency (F)	Percentage (%)
Age		
25-35 years	9	50.0
36-45 years	7	39.0
46-55 years	2	11.0
Total	**18**	**100.0**
Gender		
Male	9	50.0
Female	9	50.0
Total	**18**	**100.0**
Education level		
Masters degree	3	16.7
Bachelors degree	15	83.3
Total	**18**	**100.0**
Teaching experience		
0-10 years	12	67.0
10-15 years	3	16.5
15 years and above	3	16.5
Total	**18**	**100.0**

Table 4 shows that 50% of the teachers were aged between 25-35 years, 39% between 36-45 years and 11% between 46-55 years. This implies that the teachers were both young and old, implying that the researcher gained knowledge from a broad range of experiences. This also ensures that students can mingle with young teachers whom they could consider age mates and older ones whom they could regard as their parents and seek guidance from them. Findings also

show that there was an equality of 50% of both male and female teachers who participated in this study. This indicates that the Teacher Service Commission of Kenya has observed the one third gender rule. It also implies that the Ministry of Education,

Science and Technology (MOEST) is trying to fulfill the requirement of ensuring that staffing needs on gender equity is maintained so that students experience diversity among teaching staff. Students of a certain gender may feel comfortable being taught by educators drawn from a certain gender.

With respect to education level, 83.3% of the teachers had attained Bachelor's degree while 16.7% had Master's degree. This displays that the teachers were qualified to teach in secondary school. Majority of the teachers (67%) had served as teachers for a period between 0-10 years. This was followed by an equal percentage of 16.5 % of teachers who had an experience of between 10-15 years and above 15 years respectively. This is an indication that they have long experiences of teaching and can assist schools in registering excellent student academic performance in sciences. The findings further imply that the teachers were in a position to understand the influence of mastery learning approach on sciences academic performance.

The demographics of the study participants reflect a diverse and qualified teaching workforce in terms of age, gender, educational level, and experience. Equal representation of male and female teachers demonstrates efforts towards gender equality in staffing and promotes a balanced learning environment for students. The majority of teachers with a bachelor's degree or higher indicate a high level of qualification and expertise in teaching at the secondary school level.

The distribution of teaching experience across different ranges indicates a combination of seasoned educators and newer teachers, all able to understand and evaluate the influence of mastery learning approaches on academic performance in science.

The background information of students concentrated on age, gender and class. Table 5 presents the students' demographic information.

Table 5: Background Information of Students (n=42)

Variable	Frequency (F)	Percentage (%)
Age		
15-17 years	30	71.0
18-20 years	12	29.0
Total	**42**	**100.0**
Gender		
Male	21	50.0
Female	21	50.0
Total	**42**	**100.0**
Form/Class		
Form 3	15	36.0
Form 4	27	64.0
Total	**42**	**100.0**

Table 5 confirms that 71% of the students were aged between 15-17 years and 29% of the students were aged between 18-20 years. Findings show that all the students were within the ages of teenagers and in the adolescent stage. It is within this age range that most of them are likely to compete for success out of curiosity. The drive will make students to embrace all mastery learning techniques that will lead to mastery of content thus informing excellent student academic performance in sciences. Findings also show that there was an equal percentage (50%) of both male and female students who were involved in this current study. This indicates that the study findings are not gender biased since every gender was well represented in the study. Findings also prove that there was good representation of students from form three and four classes. These students have been in school for many years hence knowledgeable on student academic performance in sciences. Students who have been in the school for more years have adequate information on mastery learning practices with regard to students' academic performance in science subjects.

The study included a majority of students in their teenage and adolescent years, a period characterized by curiosity and a strong drive for success. This aspect may motivate them to adopt mastery learning techniques, leading to improved performance in science subjects.

The equal representation of male and female students in the study ensures that the research findings are not biased based on gender, allowing for a comprehensive analysis of how mastery learning influences science performance across different genders.

Furthermore, the inclusion of students from Form Three and Form Four classes enhances the depth of the study. These students have been exposed to school and academic environments for an extended period, potentially providing valuable insights into the effectiveness of mastery learning practices and their influence on science academic performance.

4.3 Influence of Monitoring Techniques on Student Learning Outcome

Resulting from the study findings and the response rate, the researcher distributes the following study participants. The school principals and deputy school principals (n=10), teachers (n=18), and 31 students (n=42) totaling to n=70 respondents. Notably, the term teachers are utilized in the entire study to represent both the school principals, deputy principals and teachers at large. The researcher sought to discover whether teachers were aware of any monitoring techniques that can be used in teaching and learning process. The study findings are presented in Figure 2.

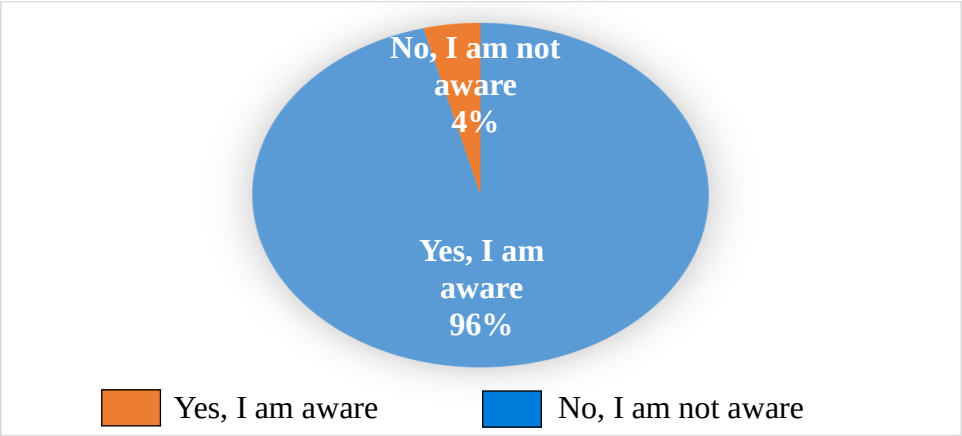

Figure 2: Awareness of Monitoring Techniques among Teachers (n=18)

Figure 2 reveals that a substantial majority of respondents (96%) acknowledged awareness of monitoring techniques applicable in the teaching and learning process, while a minority (4%) indicated a lack of such awareness. Among those aware, the reported techniques included corrective instruction, formative assessment, summative assessment, and evaluative learning strategies. These findings suggest a strong familiarity with diverse monitoring approaches among educators, which can be leveraged to enhance students' mastery of scientific content.

This finding aligns with the work of Mwangi and Njoroge (2021), who found that teachers' awareness and application of formative and evaluative strategies significantly improved learners' conceptual understanding in physics. Similarly, a study by Silva and Oliveira (2020) in Brazil affirmed that teachers' knowledge and implementation of continuous monitoring strategies directly contributed to improved academic performance in science subjects. However, in contrast to studies conducted in Tanzania and Malawi (Ndalichako, 2020; Banda & Phiri, 2022), where teacher training gaps and limited pedagogical support hindered the effective application of such techniques, the current results from Garissa County indicate a comparatively higher level of instructional preparedness.

These findings underscore the potential for targeted capacity-building and policy support to further institutionalize effective monitoring practices as a catalyst for improved mastery learning outcomes. The existing awareness among educators provides a strong foundation upon which mastery-based instructional interventions can be designed and implemented with minimal resistance.

The first research question probed the effects of monitoring techniques on learning outcomes among students taking sciences within Garissa County. The study findings are presented in Figure 3.

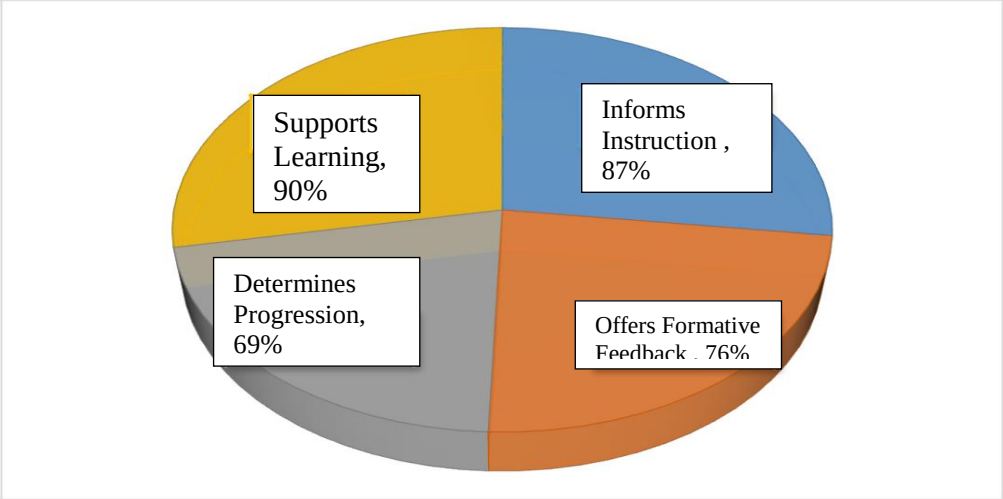

Figure 3: Influence of Monitoring Techniques on Student Learning Outcome (n=70)

As illustrated in Figure 3, a significant proportion of respondents (90%) affirmed that the application of monitoring techniques substantially enhanced the learning process among students. Furthermore, 87% indicated that such techniques informed instructional planning and delivery by teachers. Additionally, 76% and 69% of respondents reported that monitoring practices facilitated formative feedback and supported the tracking of learner progression, respectively. These results indicate that the majority of educators in the study actively utilized monitoring strategies to collect relevant data, which subsequently informed classroom decision-making and fostered

mastery of science content among learners, ultimately contributing to improved academic performance.

These findings corroborate prior research by Wambugu and Changeiywo (2018), who established that consistent use of formative monitoring tools positively influenced students' mastery in physics by enabling timely pedagogical adjustments. Similarly, Chansa and Mwansa (2021) in Zambia found that formative assessments not only informed instructional practices but also contributed to a learner-centered environment that supports content mastery. However, this study contrasts with the findings of Banda and Phiri (2022) in Malawi, where despite acknowledging the benefits of formative monitoring, many teachers struggled with effective implementation due to limited training and insufficient instructional resources.

The current findings underscore the critical role of monitoring as a dynamic component of mastery learning. The capacity of teachers to leverage monitoring data for instructional refinement and learner support reflects a growing alignment with evidence-based pedagogical practices. Consequently, the use of monitoring strategies emerges not only as a tool for assessment but also as a transformative practice that fosters science achievement among secondary school students.

4.4 Influence of Corrective Instruction on Student Learning Outcome

The second study question focused on the effects of corrective instruction on learning academic outcomes among students undertaking sciences in Garissa County. The study findings are presented in Table 6.

Table 6: Influence of Corrective Instruction on Student Learning Outcome (n=70)

Influence of corrective instruction on student learning outcome	Teachers (n=28)		Students (n=42)	
	F	%	F	%
Broadens Knowledge.	24	89.3	32	76.2
Enhances more comprehension.	21	75.0	21	50.0
Facilitates mastery of the content/subject.	19	67.9	24	57.1
Caters for diverse needs of learners.	18	64.3	28	66.7
Fills instruction gaps and areas of improvement.	23	82.1	31	73.8

As presented in Table 6, the findings reveal that a substantial proportion of both teachers (89.3%) and students (76.2%) affirmed that corrective instruction plays a pivotal role in broadening learners' knowledge. Furthermore, 82.1% of teachers and 73.8% of students agreed that corrective instruction is instrumental in addressing teaching gaps and identifying areas requiring further improvement. Notably, 75% of the teacher respondents and 50% of students reported that corrective instruction enhances comprehension, while 67.9% and 64.3% of teachers acknowledged its role in advancing content mastery and responding to learner diversity, respectively. In comparison, 57.1% and 66.7% of student respondents recognized these same benefits. These results suggest that the majority of educators effectively apply corrective instructional strategies to identify learner deficiencies, address content gaps, and differentiate instruction all of which are fundamental to supporting mastery learning outcomes in science education.

These findings are consistent with previous research by Okoye and Okechukwu (2019), who demonstrated that corrective instruction significantly improved student performance in physics by providing tailored remediation that reinforced conceptual understanding. Similarly, findings from a study in Cameroon by Ndong and Mbarga

(2022) affirmed that the strategic use of corrective feedback enabled teachers to bridge instructional gaps and support learners struggling with core science content. However, the comparatively lower percentages of student acknowledgment regarding comprehension (50%) and content mastery (57.1%) in the present study contrast with Silva and Oliveira's (2020) Brazilian findings, where student responses overwhelmingly emphasized the value of corrective instruction in promoting deep understanding.

This contrast may be attributed to contextual factors such as classroom dynamics, learner-teacher interaction quality, or students' metacognitive awareness. Nevertheless, the overall trend in the current study underscores the instructional value of corrective strategies in scaffolding learning and promoting individualized academic support—key components of the mastery learning model.

4.5 Influence of Formative Assessment on Student Learning Outcome

The third research question was to examine the influences of formative assessment on learning outcomes among students in sciences within Garissa County. The study results are epitomized in Table 7.

Table 7: Influence of Formative Assessment on Student Learning Outcome (n=70)

Influence of formative assessment on student learning outcome	**Teachers (n=28)**		**Students (n=42)**	
	F	**%**	**F**	**%**
Enhances learners in setting targets.	25	85.7	31	73.8
Identify hard concepts and topics.	26	92.9	33	78.6
Facilitates effective learning strategies.	20	71.4	30	71.4
Identify the strengths and weaknesses of	24	85.7	29	69.0

learners.

Table 7 illustrates the pivotal role of formative assessment in enhancing learning outcomes, as evidenced by 85.7% of teachers and 73.8% of students who reported that formative assessment supports learners in setting academic targets. Additionally, 92.9% of teachers and 78.6% of students indicated that formative assessment plays a crucial role in identifying difficult concepts and guiding targeted revision. Furthermore, 71.4% of teachers observed that formative assessment helped inform effective learning strategies, while 85.7% of teachers and 71.4% of students stated that it enabled the identification of learners' strengths. Similarly, 69% of students reported that formative assessments were instrumental in revealing their weaknesses. These findings suggest that feedback derived from formative assessments not only fosters self-awareness among learners but also equips teachers with the necessary insights to support struggling students and advance mastery of scientific content.

These results are in line with the findings of Otieno and Wanjiru (2022), who demonstrated that formative assessment practices significantly enhanced biology learners' engagement and comprehension by helping them pinpoint areas of difficulty and set realistic academic goals. Similarly, Mwangi and Njoroge (2021) found that formative assessment was a critical tool for physics teachers in Kirinyaga County to adapt instruction based on learners' progress and difficulties. The present study further supports the work of Nishizuka (2019) in Japan, who emphasized that when implemented consistently, formative assessment leads to improved academic self-regulation and deeper content mastery.

However, the relatively lower levels of student agreement in identifying weaknesses (69%) contrast with findings from Germany (Müller & Schmidt, 2018), where higher

student self-recognition rates were recorded. This disparity could reflect differences in learner autonomy, metacognitive development, or teacher feedback practices. Nonetheless, the current findings affirm the importance of formative assessment as an essential component of mastery learning, enabling data-driven instructional adjustments and personalized academic support.

4.6 Influence of Evaluative Learning on Student Learning Outcome

The fourth study question endeavored to examine the effects of formative learning on learning outcomes among students taking sciences within Garissa County. The research findings are presented in Table 8.

Table 8: Influence of Evaluative Learning on Student Learning Outcome (n=70)

Influence of evaluative learning on student learning outcome	**Teachers (n=28)**		**Students (n=42)**	
	F	**%**	**F**	**%**
Enhances effective learning.	26	92.9	30	71.4
Facilitates the realization of objectives.	24	85.7	31	73.8
Initiates cause-and-effect analysis.	21	75.0	30	71.4

As presented in Table 8, the findings indicate that evaluative learning plays a critical role in enhancing educational effectiveness and achieving intended learning outcomes. Specifically, 92.9% of teachers and 71.4% of students acknowledged that evaluative learning supports effective learning, while 85.7% of teachers and 73.8% of students affirmed its contribution to the realization of learning objectives. Furthermore, 75% of teachers and 71.4% of students reported that evaluative learning enables cause-and-effect analysis, thereby facilitating continuous improvement in teaching and learning

processes. These findings suggest that evaluative learning not only informs instructional quality but also offers strategic insights for educational decision-making and curriculum refinement, which are essential for advancing mastery of scientific concepts among secondary school learners.

These results are consistent with the findings of Otieno and Wanjiru (2022), who found that evaluative learning practices, such as reflective assessments and performance reviews, enabled biology teachers in Nairobi County to assess both learner outcomes and teaching effectiveness, leading to evidence-informed instructional adjustments. Similarly, Da Silva and Matola (2021) in Mozambique reported that regular evaluative reviews helped educators align instructional strategies with learner needs, promoting mastery learning outcomes. In South Korea, Kim and Lee (2019) also found that evaluative mastery learning created a feedback loop that improved both student performance and curriculum responsiveness.

Contrastingly, Ndong and Mbarga (2022) in Cameroon observed that while evaluative learning was acknowledged as valuable, its impact was limited by rigid curriculum structures and lack of institutional support for policy-level responsiveness. In contrast, the current study suggests a more optimistic outlook, where evaluative feedback is perceived as a catalyst for both classroom-level and systemic transformation. This reinforces the argument that when effectively utilized, evaluative learning can contribute not only to individual student growth but also to broader curricular reforms that foster equitable and competency-based education.

4.7 Teachers' Opinions on Effects of Mastery Learning Approaches on Learning Outcomes

The researcher sought teachers' opinion on influences of monitoring techniques on learning outcomes among students. Teachers were asked to tick on their agreement level with regards to the effects of monitoring techniques on student academic performance. The study results are presented in Table 9.

Table 9: Teachers' Opinions on effects of monitoring techniques on learning outcomes

Learning outcomes	SA		A		UD		D		SD		M	SD
	F	%	F	%	F	%	F	%	F	%		
Finding hard to work independently.	2	7.1	15	53.6	7	25.0	2	7.1	2	7.1	2.20	1.375
Being efficacious in teaching science.	7	25.0	10	35.7	1	3.6	3	10.7	7	25.0	2.40	1.133
Learner tally in science tests.	7	25.0	4	13.3	2	7.1	7	25.0	8	28.6	3.45	1.622
Science instructions offer preferences and choices.	11	39.3	10	35.7	3	10.7	3	10.7	1	3.6	1.80	1.114
Offer chances for accountability.	10	35.7	11	39.3	4	13.3	3	10.7	0	0	1.73	0.944
Science lessons foster collaboration.	7	25.0	10	35.7	7	25.0	2	7.1	1	3.6	1.97	1.159
Draw conclusions from science.	10	35.7	11	39.3	3	10.7	2	7.1	2	7.1	2.11	1.011
Skilled in analyzing logical concepts.	9	32.1	10	35.7	5	17.9	3	10.7	1	3.6	1.98	1.211
Offering correct answers to scientific queries.		25.0	11	39.3	3	10.7	4	13.3	4	13.3	2.50	1.201
Skilled in logical deductions	9	32.1	9	32.1	4	13.3	3	10.7	3	10.7	1.87	1.074

Skilled in demonstrating science practical.	8	28.6	12	42.9	5	17.9	2 7.1	1 3.6	2.07	1.172

As indicated in Table 9, the majority of teachers expressed strong agreement that monitoring techniques enhanced science instruction by allowing for personalized preferences and instructional choices (M = 1.80, SD = 1.114). A considerable proportion also agreed that these techniques promoted greater accountability in their teaching practices (M = 1.73, SD = 0.944). Teachers further acknowledged that monitoring approaches facilitated collaborative scientific learning (M = 1.97, SD = 1.159), supported conclusion-drawing in scientific contexts (M = 2.11, SD = 1.011), and improved their capacity to analyze logical concepts (M = 1.98, SD = 1.211). Additionally, teachers reported improved competence in responding to scientific queries (M = 2.50, SD = 1.201), conducting logical deductions (M = 1.87, SD = 1.074), and demonstrating science practicals (M = 2.07, SD = 1.172) following the adoption of monitoring techniques. While one item—whether learners' science test performance improved—elicited a polarized response (M = 3.45, SD = 1.622), the overall trend reflected a strongly positive attitude among teachers regarding the instructional value of monitoring strategies in science education.

These findings align with previous research by Otieno and Wanjiru (2022), who found that the implementation of formative and evaluative monitoring techniques in Nairobi secondary schools enhanced teachers' instructional planning, collaboration, and engagement with students. Similarly, Chansa and Mwansa (2021) in Zambia reported that monitoring methods fostered teacher efficacy, especially in developing logical reasoning and facilitating group-based inquiry in science classrooms. The present findings also resonate with Da Silva and Matola (2021), whose study in Mozambique

found that monitoring practices improved science teachers' confidence and effectiveness in delivering complex concepts and practical demonstrations.

In contrast, findings by Banda and Phiri (2022) in Malawi indicated that while teachers acknowledged the potential of monitoring strategies, many lacked the necessary training and institutional support to fully leverage them, resulting in lower self-efficacy and inconsistent application. The comparatively higher self-ratings and instructional confidence reported by teachers in Garissa County therefore suggest a more enabling teaching environment or a higher degree of professional development exposure.

Collectively, the evidence underscores the pivotal role of monitoring techniques not only in enriching pedagogical strategies but also in empowering science educators to enhance instructional delivery, logical reasoning, and learner engagement. The positive attitudes observed in this study reinforce the case for institutionalizing monitoring practices as a core component of science teacher development and school-based quality improvement initiatives.

4.8 Students' Opinions on Effects of Mastery Learning Approaches on Learning Outcomes

Learning outcomes	SA		A		UD		D		SD		M	SD
	F	%	F	%	F	%	F	%	F	%		
Understanding scientific terms while learning.	3	7.1	25	59.5	4	9.5	5	11.9	5	11.9	3.20	1.486
Fruitful in studying science.	10	23.8	21	50.0	1	2.4	4	9.5	6	14.3	4.30	1.346
Tally in science tests.	5	11.9	4	9.5	2	4.8	29	69.0	2	4.8	4.56	1.921
Science lessons offer opportunities.	2	4.8	36	85.7	2	4.8	1	2.4	1	2.4	3.90	1.994
Become accountable	15	35.7	24	57.1	1	2.4	1	2.4	1	2.4	2.75	0.991

Through science teachings.												
Science lessons foster collaboration.	6	14.3	7	16.7	8	19.0	18	42.9	3	7.1	2.99	1.299
Making logical deductions.	14	33.3	19	45.2	3	7.1	7	16.7	2	4.8	3.91	1.919
Skilled in scientific research.	29	69.0	2	4.8	3	7.1	7	16.7	1	2.4	2.89	1.716
Capable of answering scientific queries.	9	21.4	24	57.1	7	16.7	1	3.4	1	2.4	3.80	1.609

As shown in Table 10, the majority of student respondents expressed positive perceptions of monitoring techniques in science education. Specifically, they strongly agreed that such techniques contributed to the development of their scientific research skills (M = 2.89, SD = 1.716). Many also agreed that monitoring practices enhanced their understanding of scientific terminology (M = 3.20, SD = 1.486), supported effective science study habits (M = 4.30, SD = 1.346), and created learning opportunities within science lessons (M = 3.90, SD = 1.994). Furthermore, students reported that these techniques fostered accountability (M = 2.75, SD = 0.991), enabled logical deduction (M = 3.91, SD = 1.919), and improved their ability to respond to scientific queries (M = 3.80, SD = 1.609). However, it is noteworthy that students largely disagreed that monitoring techniques contributed to improved test performance in science (M = 4.56, SD = 1.924) or enhanced collaborative learning experiences (M = 2.99, SD = 1.299).

These findings are broadly aligned with the work of Abdi and Hassan (2023) in Garissa County, who found that students perceived formative and evaluative monitoring strategies as effective in supporting comprehension and analytical reasoning in science subjects. Similarly, a study by Da Silva and Matola (2021) in Mozambique indicated

that students benefitted from monitoring techniques through improved engagement with scientific content, particularly in the areas of critical thinking and self-directed inquiry.

In contrast, the observed skepticism regarding the influence of monitoring techniques on test performance and peer collaboration diverges from earlier findings by Mwangi and Njoroge (2021) in Kirinyaga County, where students credited mastery learning—driven by monitoring—with both higher test scores and increased collaborative learning outcomes. This variation may be attributed to contextual differences in instructional delivery, class size, or the extent to which teachers integrate peer-led activities into science lessons.

Overall, the results suggest that while students in Garissa County value the role of monitoring in fostering cognitive and metacognitive skills within science education, there remain gaps in how such techniques are perceived in relation to performance outcomes and collaborative learning. These insights point to the need for targeted pedagogical enhancements that fully exploit the collaborative and assessment-driven dimensions of monitoring in mastery learning environments.

4.9 Correlation Analysis of Study Variables

		Mastery Learning	Corrective Instruction	Formative Assessment	Evaluative Learning
Mastery Learning Approach on Learning Outcomes	Pearson Correlation	1			
	Sig. (2-tailed)				
Corrective Instruction	Pearson Correlation	.723**	1		
	Sig. (2-tailed)	.000			

Formative Assessment	Pearson Correlation	.558**	.015	1	
	Sig. (2-tailed)	.000	.894		
Evaluative Learning	Pearson Correlation	.606**	.024	.180	1
	Sig. (2-tailed)	.000	.831	.110	

**. Correlation is significant at the 0.05 level (2-tailed).

To test the study hypothesis, the researcher utilized the Karl Pearson's coefficient of correlation (r). Findings in Table 11 show that mastery learning approaches through corrective instruction (r = 0. 723, p-value=0.000), formative assessment (r = 0.558, p-value=0.000) and evaluative learning (r = 0.606, p-value=0.000) have a significant correlation with students' learning outcomes since all the p-values are below 0.005. The researcher accepts the alternative hypothesis that there is a significant positive correlation between mastery learning approaches and students' learning outcomes. This implies that mastery learning approaches are vital to inform students' academic performance in sciences within secondary schools in Garissa County.

The researcher utilized Karl Pearson's coefficient of correlation (r) to test the study hypothesis regarding the correlation between mastery learning approaches and students' learning outcomes.

Findings from Table 11 indicate significant correlations between mastery learning approaches (corrective instruction, formative assessment, and evaluative learning) and students' learning outcomes, with all p-values below 0.005.

The researcher accepted the alternative hypothesis, affirming a significant positive correlation between mastery learning approaches and students' learning outcomes in science subjects.

The use of Karl Pearson's coefficient of correlation demonstrates a statistical approach to assessing the relationship between mastery learning techniques and students' academic performance.

The significant correlations found in the study suggest that mastery learning approaches such as corrective instruction, formative assessment, and evaluative learning play a crucial role in enhancing students' academic performance in science subjects at secondary schools in Garissa County.

These findings contribute to the understanding of the effectiveness of mastery learning strategies and their influence on science education outcomes, providing valuable insights for educators and policymakers.

Monitoring techniques were found to extensively support the learning process among students, inform the instruction process among teachers, provide formative feedback, and determine progression among learners.

Corrective instruction was observed to broaden knowledge, fill teaching gaps, detect areas of improvement among learners, enhance comprehension, advance mastery of content, and cater to the diverse needs of all learners.

Formative assessment helped learners in setting targets, identifying challenging concepts and topics for revision, facilitating effective learning strategies, and identifying both strengths and weaknesses of learners.

Evaluative learning enhanced effective learning, facilitated the realization of learning objectives, and initiated cause-and-effect analysis to improve the teaching and learning process.

Overall, the study's findings demonstrate the positive influence of mastery learning techniques, including monitoring, corrective instruction, formative assessment, and evaluative learning, on science academic performance among secondary school

students in Garissa County, Kenya. These findings provide valuable insights into effective teaching and learning strategies for science education.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter focuses on the summary of the major findings and conclusions. It also suggests recommendations for potential actions and suggestions for future research.

5.1 Summary of the Study

The purpose of this study was to investigate the influence of the mastery learning approach on science academic performance among secondary school students in Garissa Sub-County, Garissa County. The study was guided by four specific objectives, each of which explored a different dimension of mastery learning: monitoring techniques, corrective instruction, formative assessment, and evaluative learning.

In relation to monitoring techniques, the findings revealed that the majority of participants acknowledged the positive role these strategies play in the learning process. Specifically, 90% of the respondents reported that monitoring techniques extensively supported student learning, while 87% indicated that such techniques informed and improved the instructional process. Furthermore, 76% of participants

noted that monitoring techniques provided formative feedback, and 69% believed that they helped determine learners' progression. These responses suggest that monitoring techniques contributed significantly to teaching adjustments and academic tracking, which in turn enhanced student mastery in science subjects.

Regarding corrective instruction, the results indicated that both teachers and students viewed it as an essential component of effective science instruction. A total of 89.3% of teachers and 76.2% of students agreed that corrective instruction broadened students' knowledge. Additionally, 82.1% of teachers and 73.8% of students believed that it filled teaching gaps and identified areas in need of improvement. Furthermore, 75% of teachers and 50% of students stated that corrective instruction enhanced comprehension, while others highlighted its role in advancing content mastery and addressing learner diversity. These findings reflect the practical role of corrective instruction in supporting students who encounter challenges during the learning process.

In terms of formative assessment, the study established that it was a vital tool in guiding students and teachers alike. According to the data, 85.7% of teachers and 73.8% of students agreed that formative assessments helped learners set personal academic targets. Moreover, 92.9% of teachers and 78.6% of students indicated that formative assessment helped identify difficult concepts and topics requiring further review. A significant portion of the respondents also acknowledged that formative assessment facilitated the adoption of effective learning strategies and helped identify both learners' strengths and weaknesses. These insights demonstrate the usefulness of formative assessment in promoting reflective learning and academic self-awareness.

The final objective focused on the influence of evaluative learning on science learning outcomes. The findings revealed that 92.9% of teachers and 71.4% of students believed

that evaluative learning enhanced effective learning, while 85.7% of teachers and 73.8% of students reported that it facilitated the realization of learning objectives. Additionally, 75% of teachers and 71.4% of students stated that evaluative learning encouraged cause-and-effect analysis, which supported improvements in the teaching and learning process. These results indicate that evaluative learning techniques not only helped in gauging academic achievement but also in improving instructional planning and decision-making.

5.2 Conclusion

The study concluded that the mastery learning approach has a statistically significant positive influence on students' academic performance in science subjects within public secondary schools in Garissa County. Specifically, monitoring techniques were found to enhance instructional feedback loops, allowing teachers to identify learning gaps early and adjust teaching accordingly, thereby improving students' progression and understanding of scientific concepts.

Corrective instruction was identified as the most influential component of mastery learning, strongly correlating with improved academic performance. This suggests that when students receive targeted remediation and timely support after formative assessments, their comprehension and retention of complex science content significantly improve.

Formative assessment practices were shown to support mastery by facilitating continuous feedback and self-regulated learning, thus empowering students to take ownership of their academic development. The application of regular, criterion-based assessments improved conceptual clarity and learner motivation.

Evaluative learning also demonstrated a positive correlation with science achievement. The use of periodic reviews and summative checks helped reinforce prior learning and contributed to long-term retention and academic confidence among students.

5.3 Study Recommendations

Based on the study findings and conclusion deducted from above, the subsequent recommendations were made:

i. Science teachers should adopt mastery learning approach as an operative instructional strategy to improve students' academic attainment in sciences within schools and in Kenya Certificate of Secondary Education level. This will inspire learners to provide and study sciences and its associated disciplines in their post-secondary education.

ii. Workshops, seminars, and conferences should be organized for science teachers to inform and modernize them with the utilization of mastery learning method strategy.

iii. Teacher mentors should incorporate mastery learning method among the teaching strategies used during training. This will equip them with the necessary skills, knowledge and competencies that will be needed while teaching students.

iv. Teacher instructors will find the research helpful in establishing programs designed at making teachers proficient of shaping learning vicinity that can match their contact with students empowering greater learner satisfaction, participation, and additional academic aspirations.

v. Additional teachers should be employed as the existing large class size might encumber effective application of the mastery learning approach as a teaching strategy. It should be note that a lot of time in needed to develop the resources is

substantial and that the formulation of learning objectives along with matching formative examinations and remedial activities is a huge overload on the few science teachers.

5.4 Areas for Further Study

Based on the study findings, the subsequent areas for further research were identified by the investigator to aid in bridging the knowledge gaps that might have been created by the current study.

i. The effect of formative assessment on student's academic performance in sciences within secondary schools.
ii. The influence of corrective instruction on student's academic performance in sciences within secondary schools.
iii. The relationship between evaluative learning and student's academic performance in sciences within secondary schools.
iv. The correlation between monitoring techniques and student's academic performance in sciences within secondary schools.

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APPENDICES

Appendix I: Questionnaire for School Principals, Deputy Principals and Teachers

Please fill the questionnaires below in the spaces provided.

NB: Tick where appropriate.

Name of school: _____

1. Gender

Male

Female

2. Level of Education

Master's

Bachelor's

Diploma

Respond to all queries on the scale:

Strongly Disagree (SD) Undecided (U) Disagree (D) Strongly Agree (SA)Agree (A)

S/N	Statements	SD	D	U	A	SA
1	I find it hard to work independently					
2	I suppose to be efficacious in teaching science					
3	I enjoy teaching science					
4	I suppose my learners to tally extremely in science examinations					
5	Science instructions provide me chances for preference					
6	Science instructions offer me chances for accountability					
7	Science lessons give opportunities for collaboration					
8	I can draw conclusion from science.					
9	I am skilled of requesting queries to aid center my logical concepts					
10	I distinguish how to discover responses to scientific Queries					
11	I am skilled of amplification of logical deductions to students					
12	I am capable of demonstrating in science practical					

Appendix II: Questionnaire for Students

Please fill the questionnaires below in the spaces provided.

NB: Tick where appropriate.

Name of school: _____

1. Gender

Male ☐

Female ☐

2. Forms

Form One ☐

Form Two ☐

Form Three ☐

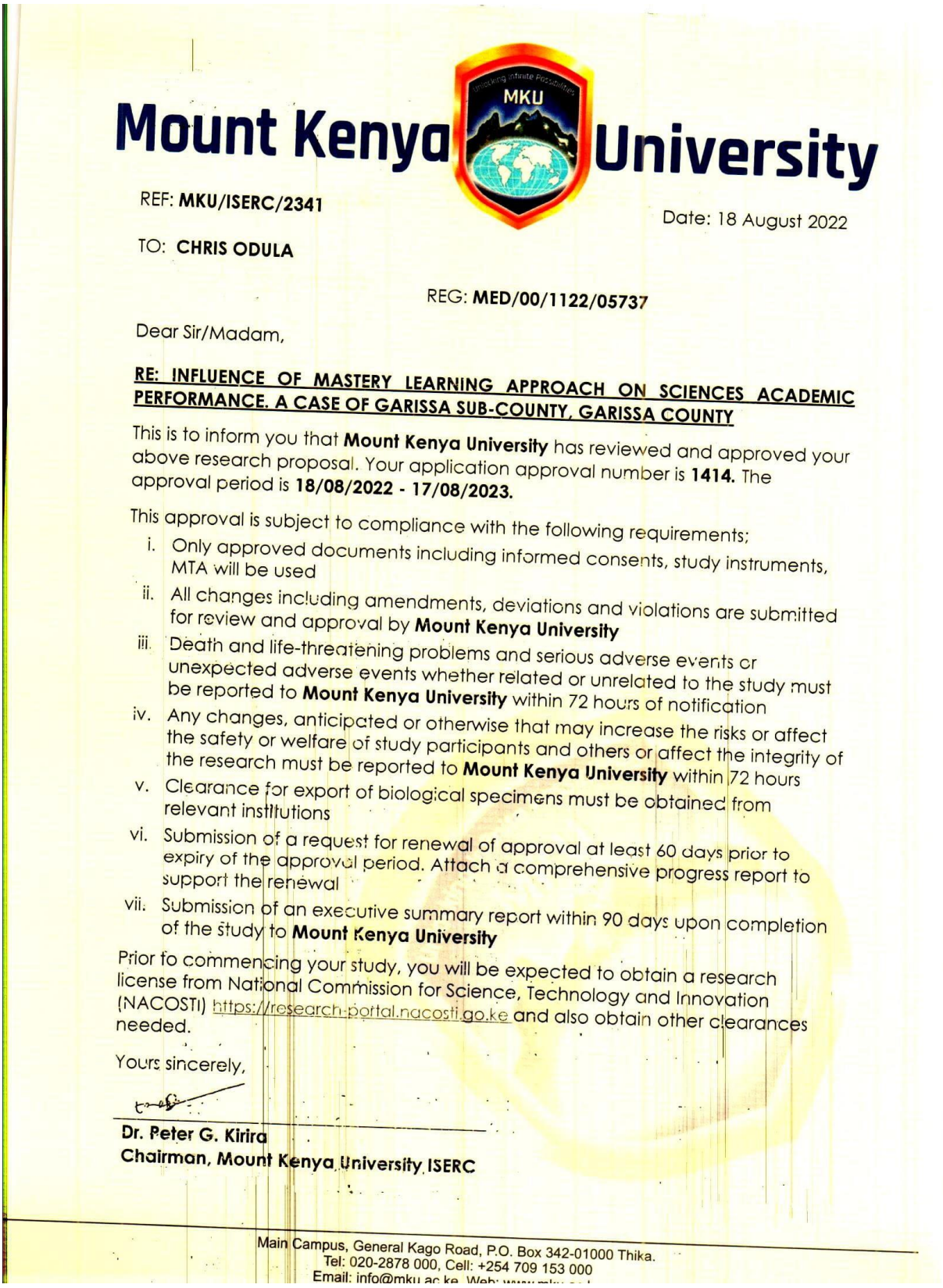
Form Four ☐

Respond to all queries on the scale:

Strongly Disagree (SD) Undecided (U) Disagree (D) Strongly Agree (SA)Agree (A)

S/N	Description	SD	D	U	A	SA
1.	I find it easy understanding science concepts while learning.					
2.	I suppose to be fruitful in studying science					
3.	I enjoy learning science					
4.	I suppose to tally exceedingly on science tests					
5.	Science lessons give me opportunities					
6.	Science teachings offer me chances for accountability.					
7.	Science lessons give opportunities for collaboration					
8.	I can pull deductions from logical information					
9.	I am talented of enquiring queries to aid focus my scientific search					

Appendix III: ERC Letter



Mount Kenya University

REF: **MKU/ISERC/2341**

Date: 18 August 2022

TO: **CHRIS ODULA**

REG: **MED/00/1122/05737**

Dear Sir/Madam,

RE: INFLUENCE OF MASTERY LEARNING APPROACH ON SCIENCES ACADEMIC PERFORMANCE. A CASE OF GARISSA SUB-COUNTY, GARISSA COUNTY

This is to inform you that **Mount Kenya University** has reviewed and approved your above research proposal. Your application approval number is **1414.** The approval period is **18/08/2022 - 17/08/2023.**

This approval is subject to compliance with the following requirements;

i. Only approved documents including informed consents, study instruments, MTA will be used
ii. All changes including amendments, deviations and violations are submitted for review and approval by **Mount Kenya University**
iii. Death and life-threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to **Mount Kenya University** within 72 hours of notification
iv. Any changes, anticipated or otherwise that may increase the risks or affect the safety or welfare of study participants and others or affect the integrity of the research must be reported to **Mount Kenya University** within 72 hours
v. Clearance for export of biological specimens must be obtained from relevant institutions
vi. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal
vii. Submission of an executive summary report within 90 days upon completion of the study to **Mount Kenya University**

Prior to commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology and Innovation (NACOSTI) https://research-portal.nacosti.go.ke and also obtain other clearances needed.

Yours sincerely,

Dr. Peter G. Kirira
Chairman, Mount Kenya University ISERC

Main Campus, General Kago Road, P.O. Box 342-01000 Thika.
Tel: 020-2878 000, Cell: +254 709 153 000
Email: info@mku.ac.ke Web: www.mku.ac.ke

Appendix IV: Introduction Letter

Appendix V: NACOSTI Authorization

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **674394**

Date of Issue: **25/August/2022**

RESEARCH LICENSE

This is to Certify that Mr.. CHRISPIN JONES ODULA ODUOR of Mount Kenya University, has been licensed to conduct research in Garissa on the topic: INFLUENCE OF MASTERY LEARNING APPROACH ON SCIENCES ACADEMIC PERFORMANCE. A CASE OF GARISSA SUB-COUNTY, GARISSA COUNTY, for the period ending : 25/August/2023.

License No: **NACOSTI/P/22/19926**

674394

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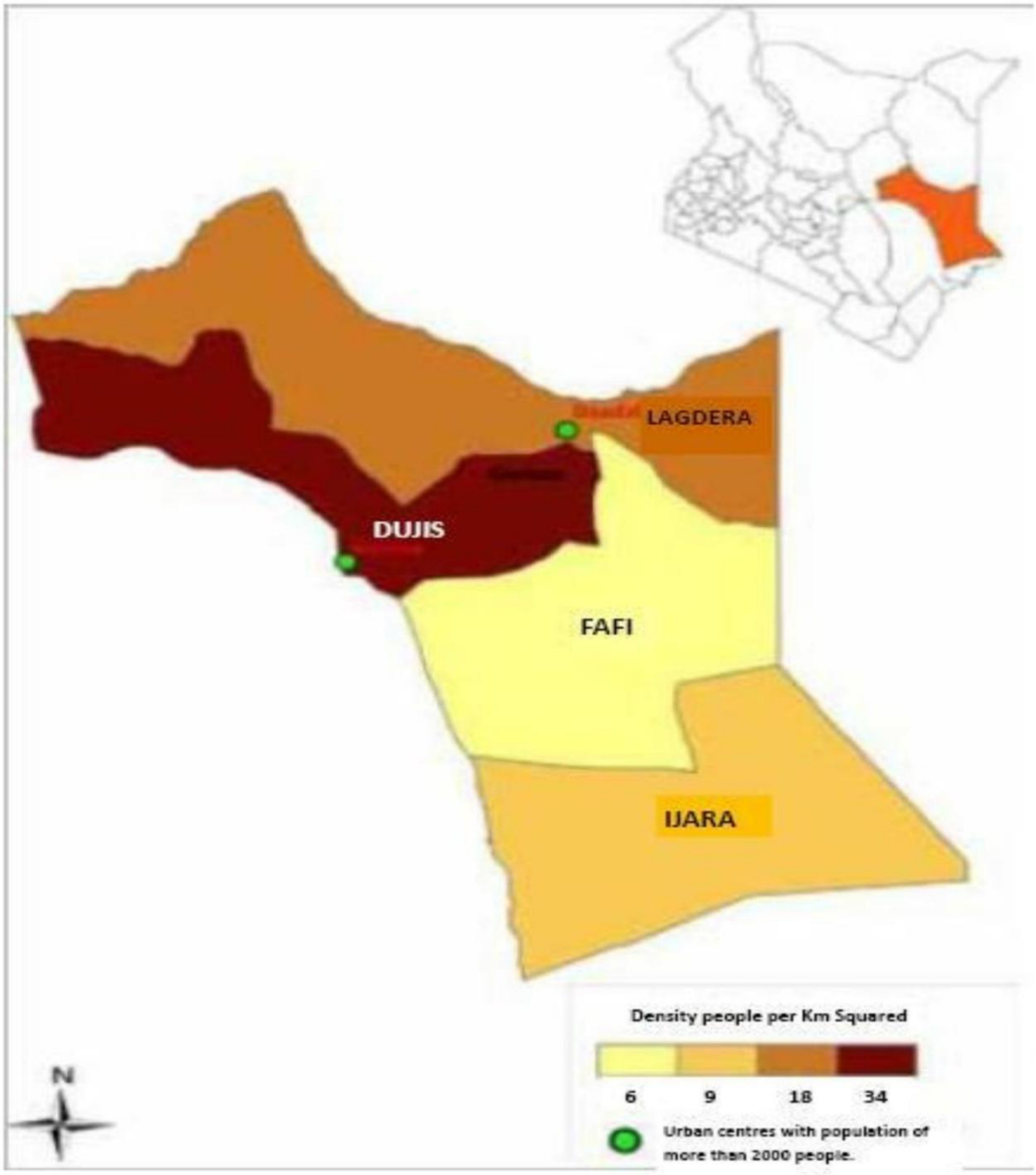
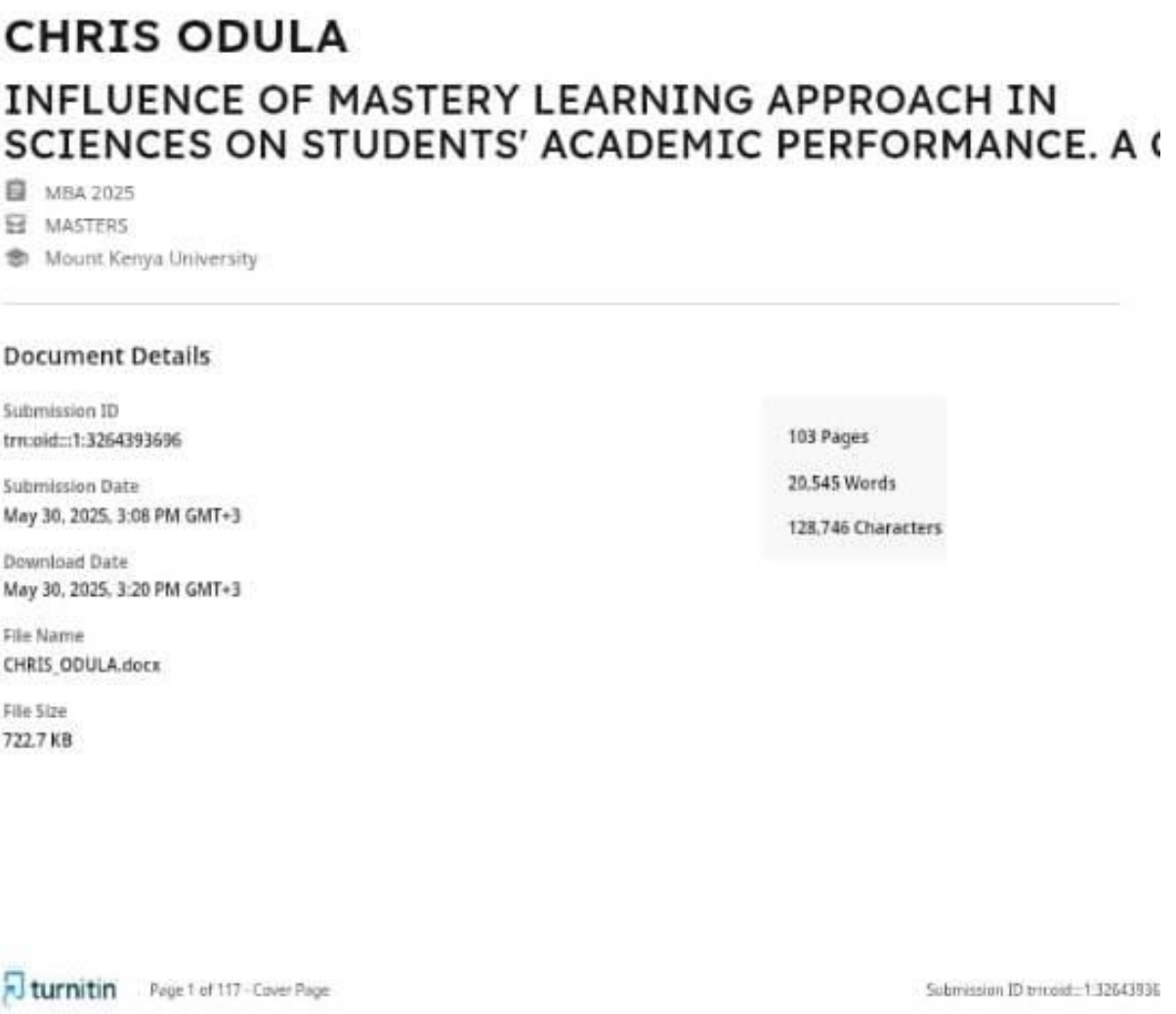
Appendix VI: Map of Garissa County



Appendix VII: Similarity Index



CHRIS ODULA

INFLUENCE OF MASTERY LEARNING APPROACH IN SCIENCES ON STUDENTS' ACADEMIC PERFORMANCE. A

MBA 2025

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  Matches with in-text citation present, but no quotation marks

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