CLASSROOM CLIMATE AND ACADEMIC BUOYANCY AS PREDICTORS OF ACADEMIC ACHIEVEMENT IN BIOLOGY AMONG FORM THREE STUDENTS IN KIAMBU COUNTY, KENYA.

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A RESEARCH THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER OF EDUCATION (EDUCATION PSYCHOLOGY) IN THE SCHOOL OF EDUCATION OF KENYATTA UNIVERSITY

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DECLARATION

I declare that this research thesis is my original work and has not been presented at any other university or institution for consideration for any certification. This thesis includes referenced sources that have been duly acknowledged. Where text, data (including spoken words), graphics, pictures, or tables have been borrowed from other sources, including the internet, these are specifically accredited and cited using the 7th edition APA system and in accordance with anti-plagiarism regulations.

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DEDICATION

I dedicate this research to my parents, Samwel and Caren Swanya; my husband; and my children, Barry, Carren, Ian, and Trevor.

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God bless you all.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS AND ACRONYMS

ABS	Academic Buoyancy Scale
KCSE	Kenya Certificate of Secondary Education
KNEC	Kenya National Examination Council
MOHEST	Ministry of Higher Education, Science and Technology
RT	Resilience Theory
SCCI	Student Classroom Climate Inventory
SPSS	Statistical Package for Social Sciences
VILT	Vygotsky Interactive Learning Theory

ABSTRACT

Kenya aims to become an industrialized nation by 2030, this vision can be supported by focusing fundamentally on science subjects. However, academic achievement in Biology which is one of the science subjects has been below average in the results released annually by KNEC, raising numerous concerns among stakeholders. This study, therefore, aimed to establish how classroom climate and academic buoyancy predict achievement in Biology among Form Three students in Kiambu County, Kenya. This research aimed to address the poor Biology achievement of secondary school students in Form Three in the Kiambu County. Study objectives were: to determine the correlation between classroom climate and students' Biology achievement, to find out the correlation between students' academic buoyancy and students' Biology achievement, to determine gender variations in classroom climate and students' academic buoyancy, and to predict interrelationship between classroom climate and academic buoyancy on students' Biology achievement. The study adopted the resilience theory by Norman Garmezy (1991) and the interactive learning theory by Vygotsky (1978). The correlational research design was also adopted. The study targeted all 4,000 Form Three students in Kiambu County. A purposive, stratified sampling method, together with simple random procedures, was utilised to select an appropriate sample size of 399 students. The following research tools were employed to gather information: the Student Academic Buoyancy Scale, the Student Classroom Climate Inventory (SCCI), and end-of-term examination scores in Biology to measure academic achievement in Biology. In this study, a pilot test was carried out in two secondary schools within the Kiambu County to ascertain the reliability of the research tools. Additionally, Cronbach's alpha was utilised to determine internal consistency. Construct, face and content validity of the research scales were ascertained through the guidance of the supervisors and experts in the educational psychology department. SPSS was employed in the cleaning, coding and analysing data whereby descriptive and inferential statistics such as Pearson correlation coefficient and multiple regression were generated for data analysis. Findings from the study indicates a negative and significant relationship between classroom climate and Biology achievement r (396) =-.103, p <.05. Concerning academic buoyancy, results established insignificant correlation between academic buoyancy and achievement in Biology r(396) =.072, p <.05. In determining the gender variations in classroom climate and academic buoyancy on Biology achievement, the study found that correlation was positive and significant for male students r (396) =019, p <.05 but not for the female students r (360) = .646, p<.05). However, academic buoyancy predicted higher Biology achievement for male students than for female students, whereas classroom climate more significantly predicted the achievement of female students than male students. Additionally, in predicting the correlation between classroom climate and academic buoyancy on Biology achievement, the regression equation revealed that academic achievement was greatly influenced by students' academic buoyancy and an interactive classroom climate. This study findings are generalized to represent the state of Biology achievement as predicted by academic buoyancy and classroom climate of students in Kiambu County. The research outcomes strongly suggest that parents and teachers should engage in activities that reinforce high academic buoyancy and sustain an interactive classroom climate. Further research is recommended to explore ways to maintain high academic buoyancy and to sustain interactive, supportive, and respectful classroom climates to ensure higher achievement among students.

CHAPTER ONE

INTRODUCTION AND BACKGROUND TO THE STUDY

1.1 Introduction

This section provides the background to the study, problem statement, study objectives, assumptions, research hypothesis, and purpose of the research, limitations, significance of the study, conceptual and theoretical framework, and the operational definition of the terms.

1.2 Background to the Study

Biology entails a detailed study of living organisms, including the examination of their structure, functioning, evolution, distribution, and interrelationships. According to Dutfield and Lim (2020) Biology is a branch of science that deals with living organisms and life processes. It is one of the oldest sciences in human history and is fundamental to understanding all aspects of life and the existence of living organisms, including humanity. It aids humans in understanding the living world and the ways in which species function, interact, and evolve. Advances in medicine, biotechnology, agriculture, and many other areas of Biology have improved the quality of life. As a science, Biology therefore influences personal development and contributes to the wellbeing of a nation (Helmenstine, 2020; Ibimenji et al., 2021).

In USA, Biology academic achievement is a significant concern among educators and parents due to declining results. However, it has been suggested that integrating active-learning approaches into more structured postsecondary classrooms may improve students' academic scores in Biology and ultimately enhance overall student performance (Canning et al., 2019). Students require remedial courses to cultivate a greater understanding and perception in the Biology learning area (Wilton et al., 2019). Also, Julio and Sulekha (2009) noted that the

classroom environment, attendance, and academic self-efficacy are the most important factors associated with passing Biology examinations.

In China, Chan (2021) indicated from teaching experience that Biology academic achievement poses significant challenges for students, particularly in attaining a deep understanding and appreciation of Biology concepts and principles. These challenges are more pronounced in pure sciences than in applied sciences. The learning difficulty in the subject is seen to originate from students' cultural background and early education. Additionally, complexities in writing and reading science texts complicate academic achievement in Biology among students. Further, Ding and Lehrer (2007) suggest that substantial evidence shows peer effects are real and operate positively and nonlinearly; decreasing the variation in peer performance enhances achievement.

In Philippines, Biology academic performance is a concern because it is crucial for helping students understand themselves and their surrounding environment. Additionally, academic achievement in this subject has remained below average in national evaluations. Research has focused particularly on the impact of students' backgrounds on academic achievement scores in Biology. In addition, Biology achievement among students is problematic and may be improved by considering many factors, such as learning experiences, test anxiety, and the development of innovative materials and teaching methods for Biology (Resty, 2021).

In Nigeria, the school environment has been the greatest impediment to Biology academic achievement among secondary school students. Schools are required to maintain a conducive environment, ensuring that class sizes are moderated, instructional facilities are of high standard, peer relationships are well monitored, school locations are appropriately spaced, and student-related factors are managed to ensure better results in Biology. According to Ezekiel and Joseph

(2021), a positive and direct relationship between classroom engagement and students' performance in Biology. Furthermore, the training and retraining of teachers, as well as teaching students how to ask thought-provoking questions, is recommended to facilitate improved performance in the teaching and learning of Biology.

In Tanzania, it is noted that Biology academic performance remains a challenge due to consistently below-average scores. This has prompted efforts to improve Biology performance in secondary schools and to meet the dreams and aspirations of students. Further, Priska et al. (2022) indicates that performance in Biology is highly influenced by various factors, including but not limited to the availability of teaching and learning facilities, students' perceptions of the subject, parents' level of education, academic resilience, the classroom environment, and the overall learning environment.

Within the Kenyan context, Ogoti et al. (2018) notes that there is concern about the increasing cases of poor achievement in Biology among other subjects, despite the efforts made by education stakeholders and parents to improve academic performance. In addition, Wakanyi (2022) observes that poor academic achievement in national evaluations should be addressed, as it negatively influences college and university placements, with Biology in particular impacting career selection among students. Further, Dinah (2023) notes that students with a positive attitude towards Biology achieve better performance in evaluations. Additionally, the accessibility of instructional materials in schools positively impacts students' achievement in Biology examinations.

With a rapidly changing education environment globally, there is a strong need to investigate the challenges affecting Biology achievement. These challenges include student wellbeing,

classroom environment, lack of school fees, student preparedness, and cultural differences, among others, which are perceived to contribute to poor academic performance in Biology (Dami et al., 2019; Ruparanganda, 2019). The scarcity of research on the relationship between academic buoyancy, classroom climate, and Biology performance in Juja Sub-County informed this study.

Classroom climate refers to the intellectual, social, physical, and emotional environments in which individuals learn. This includes, but is not limited to, teacher-student interaction, supportiveness, and respectfulness (Ambrose et al., 2010). Instances of disparity and uneven treatment towards a student or a group of students negatively impact the classroom climate. Additionally, even minor disparities can accumulate and adversely affect learning and teaching (Hirschy & Braxton, 2004; Hall, 1982). According to Qiu (2022), the benefits of positive social interactions in a supportive classroom climate include both students and teachers achieving a better understanding of each other and themselves.

Academic buoyancy is conceived as a construct representing everyday academic resilience within positive psychology and is described as learners' capacity to effectively handle academic setbacks, challenges, and difficulties that are common in the typical school experience, whether they are recurring or confined to a specific timeframe (Martin & Marsh, 2008). These challenges, drawbacks, and setbacks include, but are not limited to, below-average scores, competing timelines, heavy schoolwork, and examination pressure (Olendo et al., 2019; Marsh & Martin, 2019).

In the United States of America (USA), several studies show a positive classroom environment is one of the factors leading to improved academic achievement. A positive classroom climate and high academic buoyancy result in better academic achievement in Biology, whereas negative classroom climate and low academic buoyancy result in poorer academic achievement (Wehril, 2019; Malone et al., 2018). Furthermore, high academic achievement in Biology is seen to be correlated with a proper classroom climate and high academic buoyancy (Malone et al., 2018).

In China, studies indicate that classroom climate and academic buoyancy are major factors likely to influence academic achievement in Biology (Yan & Wei, 2022; Yu et al., 2019; Ding & Li, 2022). Classroom dimensions such as teacher-student interaction, supportiveness from class stakeholders, and student respect are factors expected to impact achievement in Biology among students (Matoy, 2022). The capacity of learners to effectively manage academic challenges and setbacks that are common in typical school life, including exam pressure, low grades, deadlines, and heavy coursework affects Biology achievement (Martin & Marsh, 2019).

Studies in Europe reveal a notable relationship between classroom climate and academic buoyancy, and achievement in Biology (Colonar et al., 2019; Hoferichter et al., 2019). The researchers observed that learners from schools with positive classroom climate attributes and higher academic buoyancy achieved better results and secured admission into higher institutions of learning, in contrast to students from unfavourable classroom climates who missed university entry due to poor achievement (Putwain & Beaumont, 2020; Mawarni et al., 2019).

In South Africa, Benita et al. (2020) found significant gender differences between school climate and the peer education environment. The researchers noted that teacher-student interactions are

key to improved academic achievement and stated that student wellbeing increases learners' motivation and satisfaction, which in turn enhances academic performance. Further, Gazki and Delavar (2019), points out that the relationship between academic buoyancy (including academic commitment, investment, dimension academic satisfaction, and academic resilience) and academic achievement in Biology is predicted to be significant.

In Tanzania, Ngussa and Nzowa (2019) note that there are a myriad of factors contributing to low achievement among students; however, classroom climate and achievement among high school students in Arusha District stand out. Specifically, it is indicated that language proficiency is significantly impacted by classroom atmosphere and the support of competent teachers. A positive classroom atmosphere has a beneficial effect on academic achievement, whereas an unfavourable classroom atmosphere results in poor academic achievement. However, Aloka et al. (2022) note a trivial negative relationship between academic buoyancy and academic performance in students.

In Kenyan context, Aurah and Wesonga (2019) note that there is concern over the increasing cases of low academic achievement among students, despite the emphasis on improving academic performance advocated by education stakeholders and parents. In a study Muthoni (2021) notes that Biology is among the subjects with poor performance in national evaluations, implying that many candidates do not qualify for careers and professions that require Biology as an admission criterion. This situation underscores the need to study students' factors, such as the schooling environment, that affect achievement in the subject.

Due to the low grades announced annually when national assessment scores are released by the Examination Body in Kenya (KNEC, 2024), this research focused on investigating whether classroom climate and academic buoyancy contribute to Biology academic achievement. Although examinations are used to assess performance, it has emerged that there are variations in the results made public each year. There is also paucity of studies in Juja Sub-County relating to classroom climate, academic buoyancy, and Biology academic achievement. Additionally, Juja Sub-County has experienced prevalent low achievement in Biology, which is worrying and underscores the urgent need for a study to address this issue. Therefore, this study delved on these variables and this formed an interesting study theme that was explored to understand the achievement among form three students. In a nutshell, this research examined how students' classroom climate and academic buoyancy predicted their Biology achievement.

1.3 Statement of the Problem

One of the major goals of Vision 2030 is to make Kenya industrialised. A key aspect of achieving Vision 2030 is promoting science and mathematics in schools, since Biology is among the three science subjects included in the secondary education programme. The importance of performance in Biology cannot be overstated; Biology contributes to socio-economic development and helps transform Kenya into an industrialised country and technological hub in line with Vision 2030. However, Biology academic achievement at the school level has remained consistently low. In Juja Sub-County, students' performance in Biology on national examinations has been poorer compared to other sub-counties in Kiambu County, as presented in Table 3.1. This poor performance in Biology as had a detrimental effect on the overall academic

achievement of many students, as grades obtained in this subject contribute cumulatively to students' final average grades.

The prevalence of underachievement in Biology among high schools in Juja Sub-County has diminished the expectations of many students progressing to higher institutions of learning to pursue science-oriented careers. Based on the background of the study, classroom climate and academic buoyancy were observed to contribute to academic achievement. However, most of the reviewed studies focused on general academic achievement rather than specifically on Biology. Additionally, there is a paucity of studies in Juja Sub-County that have investigated the correlation between classroom climate and academic buoyancy in relation to Biology academic achievement. Based on this premise, the study focused on finding out how classroom climate and academic buoyancy predicted Biology academic achievement among form three students in secondary school in Juja Sub-County of Kiambu County-Kenya.

1.4 Purpose of the Study

The research sought to establish correlation between classroom climate, students' academic buoyancy and Biology achievement among those students in Form Three in Juja Sub-County of Kiambu County.

1.5 Research Objectives

The study focused on the following objectives:

i. To establish the correlation between classroom climate and Biology achievement among students in form three in Juja Sub-County of Kiambu County.

ii. To find out the correlation between students' academic buoyancy and Biology achievement among the students in form three in Juja Sub-County of Kiambu County.

iii. To establish gender variations in classroom climate and academic buoyancy of students in form three in Juja Sub-County of Kiambu County.

iv. To predict the interrelationship between classroom climate and academic buoyancy in Biology achievement among students in form three in Juja Sub-County of Kiambu County.

1.6 Research Hypothesis

This study sought to evaluate the following research hypotheses:

i. There is a significant relationship between classroom climate and Biology achievement among students in form three in Juja Sub-County of Kiambu County.

ii. There is a significant correlation between academic buoyancy and Biology achievement among students in form three in Juja Sub-County of Kiambu County.

iii. There is a significant gender variation in classroom climate and academic buoyancy in respect to Biology achievement of students in form three in Juja Sub-County of Kiambu County.

iv. There is a significant interretionship between classroom climate, academic buoyancy and Biology achievement among students in form three in Juja Sub-County of Kiambu County.

1.7 Significance of the Study

Outcomes from the research were significant for:

i. Biology teachers by highlighting the contribution of classroom climate and academic buoyancy to students' Biology achievement. Therefore, teachers may use the findings to develop a conducive classroom climate that promotes learning in Biology.

ii. Students, it helps them appreciate the importance of an appropriate classroom climate for their Biology achievement.

iii. Curriculum developers in Kenya (KICD) in designing a Biology curriculum that could improve achievement.

iv. Researchers, it adds to the existing literature on how classroom climate and academic buoyancy predict achievement in Biology.

1.8 Limitations and Delimitations of the Study

1.8.1 Limitation of the study

Correlational design adopted could not draw conclusions on causal relationships among the variables, as the variables could not be manipulated; thus, only the correlation between the independent variables and the dependent variable could be predicted.

1.8.2 Delimitation of the Study

The study was based in Kiambu County and did not include students from all learning institutions nationwide; therefore, the research outcomes may not be generalised to the larger population outside the County. However, in mitigating this, stratified and simple random sampling techniques was applied to ensure population characteristics were well represented in the sample size. Further, this research delimited itself to learners in Form Three in Juja Sub-County as the only participants in Kiambu County. Finally, it delimited itself to Biology subject and as well the study was based on three variants; classroom climate and academic buoyancy and how they predicted Biology academic achievement.

1.9 Assumptions of the Study

It was presumed that participants presented valid and honest feedback pertaining to their classroom climate and academic buoyancy. Also, all Form Three students in Juja Sub-County experienced different classroom climate and academic buoyancy. Further, it was assumed that academic results obtained from academic departments of the sampled schools reflected the true academic progress of the sampled students. Finally, it was assumed that there is a stable learning environment in schools sampled and the reliability of measurement instruments was high.

1.10 Theoretical and Conceptual Framework

1.10.1 Theoretical Framework

Resilience model by Garmezy (1991) and Vygotsky interactive learning theory advanced by Lev Vygotsky (1978) were the basis on which the research was anchored. This is because these theories are based on academic buoyancy and classroom climate which are the predictor variables in this study.

a) Academic Resilience Theory (RT)

The study adopted the resilience theory advanced by Garmezy (1991). Resilience theory demonstrates how most people bounce back in life after encountering adverse experiences such as natural disasters, crime, war, accidents, abuse, and academic failure. Students' academic buoyancy is a notion that reflects everyday resilience in academics. It is characterised by learners' capability to effectively manage obstacles that are academic in nature and typical of school life. Therefore, this theory was applied. Garmezy believes that students learn more efficiently if they display the ability to successfully deal with academic setbacks. This is why applying the theory in the classroom can aid learners to create greater academic buoyancy and

enhance their achievement in Biology. Higher academic buoyancy results in better academic achievement in Biology among students, while lower academic buoyancy leads to poorer academic achievement in Biology (Datu & Yang, 2021). Therefore, intervention measures will be recommended to educational players and stakeholders to address students exhibiting low academic buoyancy scores. Conversely, for students demonstrating high academic buoyancy scores, interventions aimed at maintaining this positive state will be recommended to ensure sustained academic achievement. According to Martin and Marsh (2008), the age and gender of students are significantly linked with academic buoyancy, with younger male students displaying greater academic buoyancy than their peers. One short coming of this theory is that it solely identifies that academic achievement is influenced by academic buoyancy and not any other factor. However, this study was conducted to investigate this assertion.

Vygotsky Interactive Learning Theory (VILT)

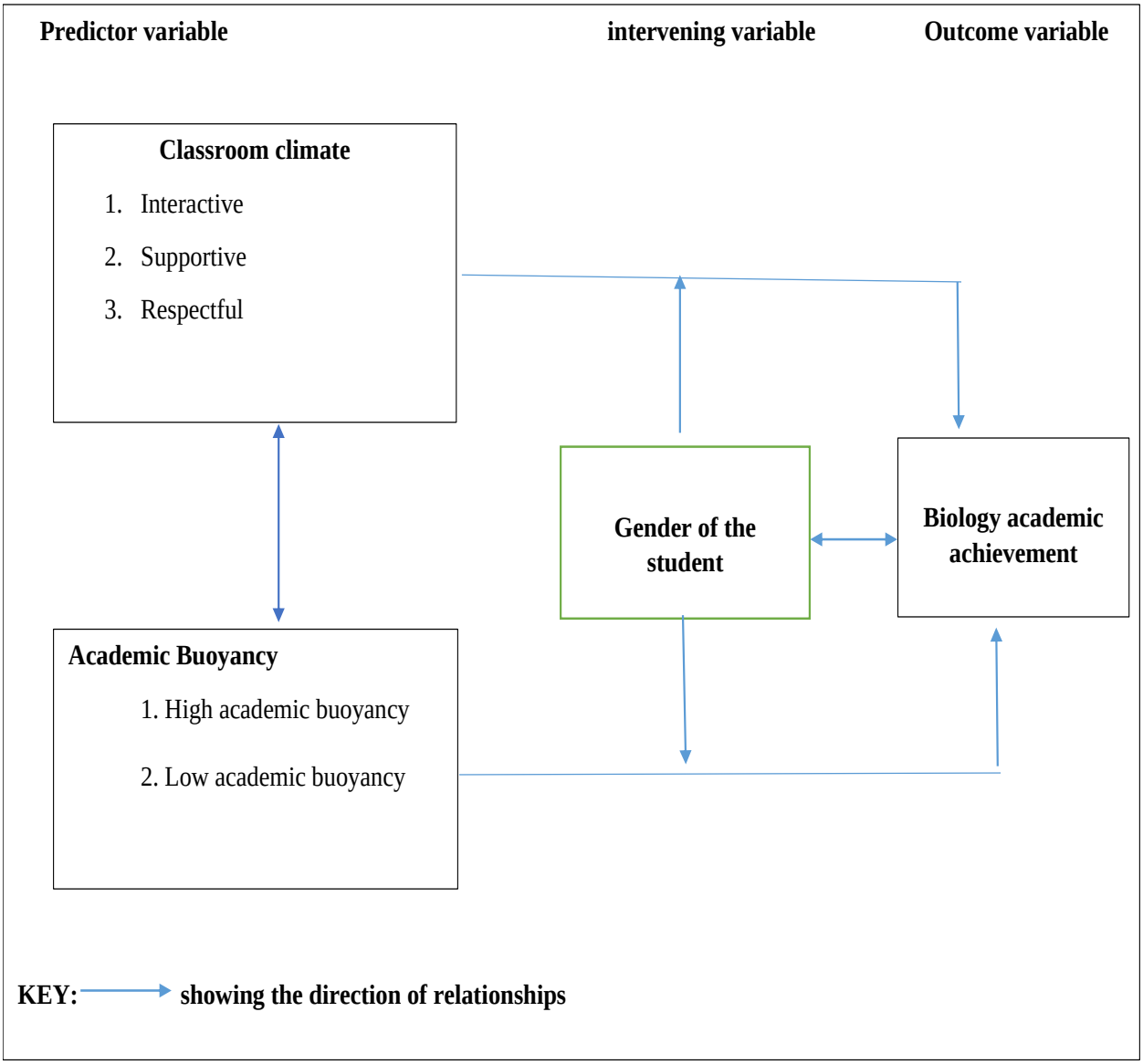
Vygotsky's (1978) interactive learning theory proposes that cognitive development is achieved through social interactions, making the learning process highly effective when students engage with socially knowledgeable peers or adults, including teachers and family members. The theory suggests that learning is fundamentally a social process, where the development of an individual's cognition occurs through social interactions. Vygotsky posits that students learn more effectively in a social environment. This is why applying the theory in the classroom can help students understand concepts more quickly. Social interaction, as identified in this theory, is a dimension of classroom climate. As a result, this theory was chosen to explore how classroom climate, including factors like social interaction, is related to students' achievement in Biology. A proper classroom climate, characterised by dimensions of support, interaction, and respect, results in better academic achievement in Biology among students. Conversely, an improper

classroom climate, marked by a lack of support, interaction, and respect, leads to poorer academic achievement in Biology (Wehril, 2019). Barnett (2019) applied the theory to assess students' academic performance and found that educators who attempt to teach at a level either below or above students' capability result in less motivated and unsupported students. Intervention measures are recommended for educational players and stakeholders to address groups of students exhibiting low classroom climate scores. For students demonstrating high classroom climate scores, interventions aimed at maintaining this positive state are recommended to ensure sustainable academic achievement. Further, a short coming of this theory is that it solely identifies that academic achievement is influenced by social learning environment and not any other factors. Therefore, this study was carried to disapprove or approve this statement. Finally, Resilience model and Vygotsky interactive learning theory provides insights on the predictor variables and they are predicted to complement one another in motivating students to achieve highly in Biology.

1.10.2 Conceptual Framework

Figure 1.1

The study is conceptualised as indicated below.



Source: Researcher, 2024

Figure 1.1 indicates the interrelationship between classroom climate, academic buoyancy and students' Biology achievement.

In this study, classroom climate entailed the dimensions of teacher-student interactions, supportiveness and respect among students or teacher-student respect in the classroom. Proper classroom climate meant good teacher-student interactions, supportiveness and whereas improper classroom climate involved poor teacher-student interactions, lack of support and respect among classroom stakeholders. Academic buoyancy was rated as high or low, students that have a higher academic buoyancy have a higher capability of dealing with students' academic challenges and drawbacks while those students that are seen to manifest a lower academic buoyancy have a dismal ability to deal with challenges and drawbacks. Biology academic achievement was indicated as the academic achievement of students in Biology and was determined from end of term scores of respondents in the study.

The conceptual framework, depicted in Figure 1.1, illustrates the proposed connections between classroom climate, academic buoyancy, and achievement in Biology. Additionally, the gender of the participants was considered as the intervening variable because it helped explain why or how predictor variables affects outcome Variable. The figure predicted the interrelationship among predictor variables of academic buoyancy and classroom climate, and the outcome variable of Biology academic achievement. Additionally, it indicated that the predictor variables were expected to have a direct correlation with the outcome variable. There was an expected degree of relationship between classroom climate, academic buoyancy and competence in Biology.

1.11 Operational Definition of Terms

Academic Achievement: Indicates the academic scores attained in Biology by students in Form Three in Juja Sub-County. This was determined by average scores in term three continuous assessment tests of the participants measured at interval scale of measurement.

Academic Buoyancy: Is the capability of students in Juja Sub-County to fruitfully deal with academic drawbacks and challenges which are of normal school life for example poor scores, competing timelines, pressure associated with examinations and hard classwork. Academic buoyancy was measured by Academic buoyancy scale at interval level of measurement.

Classroom Climate: Referred to the physical, emotional, social and intellectual environments where Form Three students in Juja Sub-County learned, in this study, it was characterised by class interactions, support and mutual respect. This was measured by student classroom climate inventory, which employed the interval scale of measurement.

Gender: Is the sex of form three students in Juja Sub-County. The students in the Sub-County were identified as either male or female.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Introduction

This section summarised the studies that was pertinent to proposed research purpose. This literature provides a crucial overview of the correlation between classroom climate, academic buoyancy and Biology academic achievement. A review of gender differences in academic buoyancy and classroom climate is also included. Moreover, a summary of the literature is presented, along with the identification of research gaps.

2.2 Classroom Climate and Biology Academic Achievement.

In the USA, Wehril (2019) studied a quantitative analysis of the California Healthy Kids Survey and the California Assessment of Student Performance and Progress to examine the effect of school climate on student achievement in California secondary schools. This study investigated the relationship between classroom climate and student academic performance. Data was collected from 1,340 students attending public middle and high schools. A quantitative ex-post facto research methodology was employed to examine the relationship between classroom climate and student academic performance. The findings indicated a highly significant variation between school climate and students' achievement. The reviewed research was based on an ex-post facto research design and general achievement, whereas this research employed a correlational study to predict the relationship between classroom climate and students' Biology achievement, a science subject.

In China, Yan and Wei (2022) conducted a study on the correlation between the prevailing classroom environment and the academic performance of teacher trainees in Guangxi. The

research aimed to investigate the academic achievement of English major teacher trainees in relation to the prevailing classroom environment. A classroom climate questionnaire was used in the study. This study employed a correlational method, involving a total of 307 students—280 females and 27 males, aged 18 to 24 years—who were English major teacher trainees in Guangxi. The Alonso Learning Style Questionnaire and Strategy Inventory were used to collect data. The researchers found that the prevailing classroom environment was positively related to students' academic achievement among English major teacher trainees. While this study focused on secondary school students at a developmental stage of adolescence, where the environment plays a significant role in academic achievement, the study by Yan and Wei concentrated on college English students at a higher developmental stage, who adapted more easily.

A study conducted in the Philippines by Matoy (2022) assessed the correlation between classroom climate and the achievement of undergraduate learners. The aim of this research was to explore the connection between classroom climate and academic achievement. The study involved fifty-five (55) third-year students pursuing Radiology Technology at Cebu Doctors University. A descriptive correlational design was employed to explore the correlation between classroom climate and academic achievement. The study found that both physical and emotional classroom climates positively impacted students' academic performance in nuclear medicine. The reviewed study focused on a small sample size of 55 students, which was susceptible to high classical errors, whereas this research was based on a larger sample of 399 respondents, allowing for generalisation to the wider population.

A study conducted in Nigeria by Ibimenji et al. (2021) explored the interrelationship between classroom environment and Biology academic performance among students in senior secondary schools. This study assessed how the learning environment influenced the academic performance

of Biology students in Rivers State. A total of 345 senior secondary three students taking Biology were sampled using a random sampling technique from thirty-five senior secondary schools. The Biology Performance Test (BPT) and Classroom Environment Assessment Questionnaire were utilised to collect statistical information in this descriptive survey design. The outcomes of the research indicated a significant relationship between the classroom environment and students' Biology achievement. However, the study reviewed here was based on a descriptive survey design, which cannot establish causal relationships between variables, whereas this research focused on a correlational research method that assessed the correlation between the study variables.

In Kenya, Kamoet, and Mbirithi (2024) conducted a study to investigate the relationship between classroom climate and academic achievement of secondary school students in Mombasa County. The aim of this study was to investigate the impact of the classroom environment on academic performance in public secondary schools. 1000 students participated in the study and descriptive research design was utilised. The results indicated a significant relationship between these two variables. The research found a significant correlation between classroom climate and academic achievement of secondary school students. This study focused on descriptive research design for general academic achievement, whereas this research was specifically concerned with the correlation between classroom climate and Biology academic achievement.

2.3 Academic Buoyancy and Biology Academic Achievement

This section provides a review of existing research on academic buoyancy and Biology achievement. The studies reviewed aimed to predict the relationship between the predictor variable, academic buoyancy, and the dependent variable, Biology academic achievement. This crucial overview formed the basis for this study. Furthermore, research gaps were identified that

highlighted the need for this study. Academic buoyancy was rated as either high or low. Higher academic buoyancy was predicted to be related to better Biology academic achievement, while lower academic buoyancy was predicted to be associated with poorer Biology academic achievement.

In the UK, Putwain and Beaumont (2020) conducted a study on academic buoyancy, focusing on how it overcome minor academic setbacks and maintain their academic progress. This research investigated if academic buoyancy influences the relationship between minor academic setbacks and future academic performance. This research employed a descriptive correlational research design to collect statistical data from 539 upper secondary students in the sixth form. The findings indicated that the relationship between academic buoyancy, subsequent achievement, and minor academic adversities was significant. This reviewed study focused on upper secondary students in the sixth form, who are at a higher developmental stage, whereas this study concentrated on secondary school students at a different developmental stage, specifically adolescence, where the environment significantly influences academic outcomes.

Yu et al. (2019) conducted a study in China on motivation, engagement, academic buoyancy, and adaptability. The research aimed to assess the influence of socioeconomic and demographic factors on the academic buoyancy of junior secondary students. A correlational research method was employed. A total of 2,434 junior secondary school students aged between 11 and 15 years participated in the research. The findings revealed non-significant interactions between demographic and socioeconomic factors and academic buoyancy. While the reviewed study focused on students' adaptability, this research focused on the relationship between academic buoyancy and Biology achievement.

A study conducted in Australia by Martin and Marsh (2019) examined the interrelationships between academic buoyancy and students' academic adversity. This study examined the relationship between academic buoyancy and academic adversity among 481 high school students aged 7 to 12 years. A longitudinal research design was used to examine the relationship between academic buoyancy and academic adversity. Results showed a positive association between high academic buoyancy and reduced subsequent academic setbacks, but no evidence of academic adversity leading to increased academic buoyancy. Additionally, while the reviewed study focused on a longitudinal research design and academic adversity among students, this research was based on a correlational research design to assess the correlation between academic buoyancy and students' Biology achievement.

In the Philippines, Datu and Yang (2021) investigated the relationship between academic buoyancy, motivation, and achievement among Filipino high school students. A correlational research design was adopted, and 393 Filipino secondary school learners participated in the research. The outcomes of the research identified academic buoyancy as being closely correlated with an increased level of academic achievement. While the reviewed study was conducted in the Philippines, this study focused on a different geographical area, specifically Kiambu County in Kenya, due to the scarcity of related studies in that region.

In Nigeria, Aloka et al. (2022) studied the association between self-handicapping in final-year students and their academic buoyancy. This study investigated the connection between academic buoyancy and self-handicapping among final-year students in the Nsukka educational zone. A cross-sectional survey methodology was employed, and statistical data were obtained from 120 final-year students sampled through a multistage sampling procedure. Data on self-handicapping and academic buoyancy was collected using respective scales. The findings indicated a low and

negative non-significant interrelationship between students' academic buoyancy and their self-handicapping (B = -0.105, R = -0.105, P < .253). While the reviewed study focused on a cross-sectional research method, this research utilised a correlational research method to determine the correlation between the variables.

In Kenya, Wakanyi et al. (2022) studied self-regulation, academic buoyancy, and students' academic performance among Form Two learners in government-owned institution in Nairobi. The study investigated the association between students' self-regulation and their academic achievement in the county. A correlational research method was employed to determine the relationship between the variables under study, and a sample size of 738 students from eight public high schools was utilised in collecting statistical data. Results indicated that academic buoyancy and emotional self-regulation recorded a weak negative statistically non-significant relationship with academic performance. The reviewed study was on general students' achievement. However, this research sought to predict the correlation between learners' academic buoyancy and their Biology academic performance.

2.4 Gender Differences in Classroom Climate and Academic Buoyancy.

The studies were reviewed to predict the gender differences in the independent variables; classroom climate and academic buoyancy. The crucial overview was the basis that informed this study. Furthermore, research gaps were identified that indicated to the need of this study.

In China, Ding and Li (2022) conducted research on the correlation between academic buoyancy and burnout among Chinese tutors. The study primarily explored the correlation between teachers' buoyancy and their burnout. A correlational study involving 399 tutors from eleven

regions in China was conducted. The researchers found a significantly negative correlation between burnout and buoyancy among all EFL teachers in China. Furthermore, gender was not a significant factor affecting these variables among EFL teachers in China. However, the study reviewed here focused on Chinese EFL teachers at a higher developmental stage who adapted easily, whereas this study focused on secondary school students at a different developmental stage, that is, adolescence, where environmental factors significantly impact academic outcomes.

In Indonesia, Mawarni et al. (2019) studied the correlation between buoyancy and academic outcomes of high school science learners in Bandung city. The study objectively explored academic buoyancy across all genders. This research adopted mixed methodologies with a concurrent embedded strategy, and statistical data was obtained from 289 senior secondary students in the 2017/2018 academic year, selected using random sampling techniques. The researchers found significant gender variation in students' buoyancy in academics, with male learners having greater academic buoyancy than female science students. The reviewed study focused on a mixed methods research design, whereas this study was based on a correlational research method to establish the relationship between the outcome and predictor variables.

In India, Bala (2019) studied gender variations in academic resilience and students' academic buoyancy among international learners. The main aim of the research was to determine gender variations among international students regarding academic buoyancy. A descriptive survey method was utilised in the research. A total of 500 non-local students from Punjab and Chandigarh universities were selected as the sample size. Results showed significant variation in academic resilience, with students' academic buoyancy being higher in female students compared to male international students. The reviewed study focused on a descriptive survey

research design, while this study was based on a correlational research method to determine the correlation between the study variables.

In South Africa, Benita et al. (2020) studied classroom climate as an enabling factor in a supportive peer education setting. The research concentrated on evaluating the effect of peer education programmes on classroom climate. A qualitative longitudinal experimental research design was adopted, and structured scales were employed to gather statistical data from 35 Western Cape secondary school students. Researchers found significant gender differences between school climate and the peer education environment. However, the study reviewed here focused on a qualitative longitudinal experimental research design in classroom climate and peer education, whereas this research was based on a correlational research design to find gender differences in academic buoyancy and classroom climate in Biology academic achievement

In Kenya, Bii (2025) investigated academic resilience and learning environment among counselling psychology students. A total of 76 university students participated in the research. The study utilised descriptive research design, and the findings showed that academic resilience significantly predicts academic performance. Additionally, no significant gender variations were observed in academic resilience and learning environment. The study reviewed here focused on descriptive research design while this study focused on correlational research design and secondary school students at a different developmental stage, that is, adolescence, where environmental factors significantly influence academic achievement.

2.5 Classroom Climate and Academic Buoyancy on Biology Academic Achievement.

The studies were reviewed to predict the relationship of the independent variables, classroom climate and academic buoyancy, on the dependent variable, Biology academic achievement. This

crucial overview was the basis that informed this study. Furthermore, research gaps were identified that pointed to the need for the current study.

In the USA, Malone et al. (2019) conducted a study on classroom climate, engagement, and students' academic achievement. This research examined the validity of the authoritative school climate theory**,** student engagement, and its association with academic achievement. A correlational study involving 60,441 students and 11,442 teachers from 298 high schools was conducted. Data analysis revealed a strong positive correlation between classroom environment and academic achievement. While previous research often focused on general academic performance, this study specifically examined the relationship between classroom climate and Biology achievement.

Hoferichter et al. (2021) conducted a German study exploring the relationship between academic buoyancy, supportive classroom, and school environments. The study mainly examined the influence of supportive class, academic buoyancy, and students' institutional climate on Finnish junior high school learners. The research employed a longitudinal research method and collected data from a sample size of 1,024 students from grades seven to nine. Latent structural equation model results indicated that students' academic buoyancy significantly led to satisfaction in school. The reviewed study focused on longitudinal research design and school well-being among students, whereas this study was based on a correlational research approach to find the correlation between classroom climates and academic buoyancy in Biology academic performance.

In Sydney, Colonar et al. (2019) explored the interrelationships among academic buoyancy, self-concept, and academic achievement. A correlational research design was adopted to examine academic buoyancy, and a sample size of 191 senior primary pupils participated in the study. Results indicated a positive relationship between students' academic buoyancy and students' performance. However, the reviewed research focused on primary school students at a lower developmental stage, whereas this research was based on high school students at a different developmental stage, specifically those undergoing the adolescence crisis.

A study was conducted in Saudi Arabia by Sayed (2022) investigating university students' academic buoyancy and its relation to academic performance. The research aimed to predict the levels of students' academic buoyancy and determine its correlation with their academic performance. A descriptive-analytical research design was adopted, and data was gathered from a sample of 243 university learners who responded to the academic buoyancy scale. The findings indicated that most university students had a relatively high level of academic buoyancy and academic performance. Furthermore, gender and academic discipline had no significant impact on academic buoyancy. The reviewed research focused on a descriptive-analytical research design in university students at a higher developmental stage, whereas this study used a correlational research method to determine secondary school students at a different developmental stage, namely adolescence, where the environment plays a significant role in academic achievement.

In Tanzania, Ngussa and Nzowa (2019) explored the association between classroom climate and language proficiency, which reflects the academic achievement of high school learners in Arusha. This research aimed to determine the correlation between competency in the English

language and the learning classroom climate of students in Arusha. A total of 180 secondary school students were used as the sample size. A survey was employed, and the results indicated that language competency is positively and significantly influenced by classroom structures and supportive teacher-student relationships. The study reviewed focused on survey research design, whereas this research adopted a correlational research method to assess the correlation between the variables under study.

In Kenya, Olendo et al. (2021) conducted research on the association between students' academic buoyancy and self-efficacy among sampled Form 3 secondary school students. The research aimed to explore the correlation between academic buoyancy and self-efficacy in Form Three students. A mixed methods research design was employed, and a total of 217 boys and 252 girls from both private and public schools in Migori County took part in the study. The findings revealed that self-efficacy predicts students' academic buoyancy and no significant gender differences were identified among the respondents. The study reviewed here focused on a mixed methods design whereas, a correlational research design was used to investigate the association between the dependent and independent variables.

2.6 Summary of Literature Review and Gaps Identification

The reviewed literature indicated that classroom climate and academic buoyancy are key factors influencing students' achievement in Biology. However, it was noted that significant variations in Biology achievement could not be solely attributed to inappropriate classroom climate and the absence of academic buoyancy. In terms of classroom climate and Biology achievement, the summary of identified gaps includes: firstly, it was not readily apparent what caused variations in classroom climate among different students; secondly, most studies were not based on correlational research design, which explicitly assess the correlation between classroom climate

and Biology achievement; and lastly, most studies were conducted in institutions other than secondary schools.

In academic buoyancy and Biology achievement, there seems to be no clarity regarding the extent to which academic buoyancy affects academic achievement among students. Most studies have focused on general academic achievement at a higher developmental stage, rather than on secondary schools as addressed in this study. Furthermore, concerning gender differences in classroom climate and academic buoyancy's impact on Biology achievement, most studies did not focus specifically on Biology academic achievement, and the sample sizes were smaller compared to the larger sample size of 399 students used in this study, which supports generalisation to a broader population.

Ultimately, regarding the interrelationship between classroom climate and academic buoyancy on Biology academic achievement, there was a scarcity of studies on these variables within the context of Biology achievement. Consequently, the precise impact could not be accurately determined. This highlights the need for research addressing the lack of studies on these variables in Juja Sub-County

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

This section involves research design, the study location, target population, data collection tools, validity and reliability of the study tools, criteria for data collection, piloting, data collection methods, data analysis, as well as ethical and logistical consideration.

3.2 Research Design

In finding relationship between predictor and outcome variables, the correlational research design was employed (Pritha, 2021). The design focused on studying the relationship between variables to predict behaviour without manipulating the variables. Structured questionnaires were as well utilized to gather statistical data. The analysis of data and interpretation were based on the study objectives (McCombes, 2022). The data were measured on an interval scale.

3.3 Variables

Biology academic achievement was the dependent variable while classroom climate and academic buoyancy was the independent variables. Data was collected to determine the relationship between variables (Bhandari, 2022). Table 3.1 shows the variables and their level of measurement.

Table 3.1

Levels of Measurement of the Variables

Variable	Type	Scale of Measurement
Academic Buoyancy	Predictor variable	Interval scale
Classroom climate	Predictor variable	Interval scale

Biology Academic Achievement	Outcome variable	Interval scale

From table 3.1 all the variables will be measured at interval scale of measurement.

3.4 Research Methodology

This was a quantitative study that adopted correlational research design. This approach is efficient for collecting data from a large sample size (McCombes, 2022).

3.5 Location of the Study

The research was undertaken in Juja Sub-County due to the following reasons: most schools in the locale were below average in Biology academic achievement as compared to other Sub-Counties, there was little research that had been conducted previously in the locale, paucity of studies made the area suitable for the study (Ceccato et al., 2025). Juja Sub-County had 36 secondary schools that involved mixed day schools, mixed boarding schools, girls and boys boarding schools. Further, Juja Sub-County has mixed socio-economic status and different cultural backgrounds.

Table 3.2

Juja Sub-County Average Scores for Biology, Chemistry and Physics (2018-2023)

SUBJECT	2018	2019	2020	2021	2022	2023	Average per Subject
BIOLOGY	4.2	4.3	4.0	4.7	3.7	3.3	4.03
CHEMISTRY	4.1	3.7	3.9	4.0	4.4	4.2	4.05
PHYSICS	6.3	5.8	5.8	5.3	5.6	5.9	5.78

Source: Kiambu County Ministry of Education office.

The Table summarises the achievement trends in three subjects in Juja Sub-County from 2018 to 2023. Biology recorded the lowest achievement compared to Physics and Chemistry over this five-year period. Juja Sub-County recorded an average academic achievement in Biology that was below the average mean of 5.0. This underscores the rationale for undertaking the research in Biology achievement.

3. 6 Target Population

A population of all 4,000 respondents consisting of Form Three learners from all 36 public secondary institutions in Juja Sub-County were targeted. This is because public secondary schools have recorded dwindling academic achievement. Form Three students were chosen because of their advanced experience in secondary school, as they had already selected their career paths by choosing their subjects (Bhandari, 2022).

3.7 The Sampling Techniques and Sample Size

3.7.1 Sampling Techniques

Juja Sub-County was purposively chosen for the study because of below average academic achievement. Stratified sampling procedure was applied to segment the 36 public secondary institutions in the area (McCombes, 2022). Within these sub-groups, 12 institutions were sampled using simple random procedure and included in the research. According to Dell et al. (2002), 12 schools exceed the minimum requirement of 10 schools. Finally, numbers were allocated and drawn randomly from a basket to give an identical possibility of selection for each school category (Kothari, 2004).

3.7.2 Sample size

A simplified formula by Yamane (1967) was utilised to determine sample size because of its accuracy in determining representative sample size from a large target population (Kothari, 2004). This was calculated as; $n=N\div (1+N (e)^{2})$. Where n represents the sample size and N is the population size while E denotes the desired level of precision. Therefore,

$4000\div (1+4000 (.05)^2) =363$

In the study, in order to take care of those participants who opted to leave the study or non-responders, an attrition bias of 10% was added (Singh et al., 2020). Therefore, from the total sample of 363, 10% of the participants was added. Hence, n=363+36= 399 participants made up of 200 boys and 199 girls as indicated in Table 3.2.

Table 3.3

Sampling Distribution and Sample Size Frame

Type of schools	The Population			Sample size			
	Schools	Students		schools	No of students in 12 schools		Sampled Students
		Boys	Girls		Boys	Girls	Boys Girls
Boys' boarding	6	1300	-	2	297	-	116
Girls boarding	5	-	1000	2		221	- 87
Co-educational	25	800	900	8	214	258	84 112
Sub-total		2100	1900	12	511	479	200 199
		52.5%	47. 5%				
Total	36 100%	4000 (100%)		12(33%)	990(33%)		Sample of 399 (13%)

Source: Researcher 2023

Note. The total number of boys and girls in sampled schools were proportionately sampled.

No - means number

3.8 Research Instrument

The study adapted a classroom climate scale and an academic buoyancy scale to obtain data from the respondents. Precisely, the researcher sought to determine the correlation between classroom climate and academic buoyancy on Biology academic achievement of students. Structured scales were administered to sampled Form Three students. The returned questionnaires were accompanied by end of term one exams scores of the participants. According to Moses (2010) questionnaires guarantees confidentiality and are the most appropriate research tools.

3.8.1 Classroom climate Scale

A scale created by Hadiyanto et al. (2019) was adapted because it focuses on classroom climate. The scale was adjusted to suit Biology academic achievement of form three students. This scale was called Student Classroom Climate Inventory (SCCI)comprising 49 questions. It used a five-point Likert scale to measure classroom climate, with answer options as follows: 1 = strongly disagree, 2 = disagree, 3 = undecided, 4 = agree, and 5 = strongly agree. The questionnaire included both positively and negatively framed items to measure Interactive, Supportive, and Respectful classroom climates. For negative statements, a score of one indicated the best classroom climate, while for positive statements, a score of five indicated the best classroom climate (see Appendix II). The participants will be given 30 minutes to respond to the questionnaire. Permission to use the scale was sought and granted

3.8.2 Academic Buoyancy scale

The Academic Buoyancy Scale developed by Martin and Marsh (2008) was adapted. The scale, known as the Academic Buoyancy Scale (ABS), consisted of 16 questions. It utelised a five-point Likert scale to rate academic buoyancy, with answer options as follows: 1 = strongly disagree, 2 = disagree, 3 = undecided, 4 = agree, and 5 = strongly agree. The data were analysed by the use of SPSS to predict the relationship between students' academic buoyancy and their Biology achievement. Questionnaires included both positively and negatively framed items to measure levels of academic buoyancy, ranging from low to high. For negative statements, a score of one indicated high academic buoyancy, while for positive statements, a score of five indicated high academic buoyancy, and vice versa (see Appendix III). The respondents will be given 30 minutes to respond to the questionnaire. Permission to use the scale was sought and granted

3.8.3 Document Analysis

Document analysis entailed pro forma summary of Biology end of term one examinations results, and academic report from class teachers. Document review will take one hour.

3.9 Pilot Study

Iddagonda (2017) notes that a pilot size of 1% to 10% of the sample size is advocated. The pilot involved two schools and a total of 60 participants in order to have sample students from both genders. Piloting was conducted at Juja Township Secondary School and Githunguri High School to enhance the questionnaire's content validity and reliability (Middleton, 2020).

3.10 Validity and Reliability of the Study

3.10.1 Validity of the Study

The research tools were reviewed by my psychology colleagues, peers, supervisor, and experts from the educational psychology department to improve the items. This step was crucial to ensure that the face validity of the scales was attained (Middleton, 2020). Construct validity was established through confirmatory factor analysis, while external validity was ensured through systematic sampling of participants (Lauren, 2020).

3.10.2 Reliability of the Study

The correlation coefficient was determined using Cronbach's Alpha. This is because Cronbach's Alpha is accurate in determining reliability, easier to compute and interpret (see Appendix V).

Table 3.4 indicate the reliability diagnostics of the research instruments applied.

Table 3.4

The Reliability Diagnostics of the study tools

Scale	No. Items	Cronbach's alpha (Authors)	Cronbach's alpha (Pilot)
Classroom climate	49	.72	.87
Academic buoyancy	16	.86	.75

Table 3.3 indicates the calculation of Cronbach's alpha (α) for classroom climate and academic buoyancy generating the reliability of the research scales. From the results, the reliability coefficient for classroom climate was .87 while the reliability for academic buoyancy was .75. A study by Taber (2018) recommended a maximum reliability coefficient of 0.7. Since the

Cronbach alpha generated values slightly higher than 0.7, then, the questionnaires were reliable in measuring classroom climate and academic buoyancy.

3.11 Data Collection Procedures

Data collection was conducted within a one-month timeframe. The data was collected using structured questionnaires, which were issued to sampled participants who were given sufficient time to respond. Biology continuous assessment tests were collected from the academic departments of the sampled schools.

3.12 Data Analysis

The research outcomes were organized through editing to ensure accuracy, completeness and uniformity. SPSS program version 25 was used to organise and code data. Research hypotheses were evaluated by use of both inferential and descriptive statistics as indicated below.

H_{01} There isn't statistical significant relationship between classroom climate and Biology achievement of students. Here Pearson product moment correlation coefficient was employed to evaluate the interrelationship between classroom climate and Biology achievement because it is accurate in giving the relationship between duo variables.

H_{02} There isn't statistical significant correlation between students' academic buoyancy and students' Biology achievement. To predict the relation between academic buoyancy and Biology achievement, Pearson product moment correlation coefficient was utilised because it is precise in giving the correlation between two variables.

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H_{03} There aren't any statistical significant gender variations in classroom climate and students' academic buoyancy on Biology academic achievement among Form Three students. Here multiple regression was utilised to evaluate the gendered variations in classroom climate and academic buoyancy on Biology achievement because it is efficient in giving the relationship between multiple variables.

H_{04} There is no interrelationship between classroom climate and students' academic buoyancy on Biology achievement. Multiple Regression was employed to determine the correlation between classroom climate, academic buoyancy and Biology achievement because it is accurate in giving the predictive weight when dealing with more than two variables.

3.13 Logistical and Ethical Consideration

3.13.1 Logistical Consideration

An introductory letter from Kenyatta University was utilised to secure a research permit from NACOSTI. The researcher then visited the Juja Sub-County education office to explain the purpose of the research, the types of institutions that were to be visited, and the schedule for the research. Additionally, the heads of the selected secondary institutions were briefed to ensure that harmony was achieved.

3.13.2 Ethical Consideration

Voluntary participation and anonymity were assured. The sampled data was kept confidential. Consent forms were issued as shown in Appendix I. This was essential to ensure participants' willingness to freely engage in the research.

CHAPTER FOUR

PRESENTATION OF FINDINGS, INTERPRETATION AND DISCUSSION

4.1 Introduction

This section presents the study's outcomes, which involves an interpretation of the statistical data obtained and a discussion of the findings. It covers participants' demographics and analysis based on the study objectives will be presented.

4.2 General and Demographic Information

Table 4.1 shows the response rate of the study tools.

Table 4.1

Return Rate of Questionnaires Issued

School categories	QI	QR	RR (%)
Boys boarding schools	116	113	97
Girls boarding schools	87	87	100
Co-educational institutions	196	196	100
Total	399	396	99

Note. QI- number of Questionnaires Issued; QR- number of Questionnaires Returned; RR- percentage Return Rate.

Table 4.1 shows that the study was conducted across three levels of schools. Questionnaires were distributed to participants by the researcher, a research assistant, and some Biology teachers. Of the 399 questionnaires distributed, a 99% response rate was achieved with 396 returned. Among them the 116 questionnaires sent to boys' boarding schools, 113 were returned, yielding a 97%

response rate. Additionally, the return rates for girls' boarding schools and co-educational institutions were both 100%. The overall questionnaire return rate was 99%, which exceeds the recommended minimum of 80% as suggested by Meng-Jia et al. (2022). Analysis of the questionnaires returned revealed that they were appropriately filled and suitable for generating the study findings.

4.2.2 The Respondents Demographic Information

Demographic data collected from participants included gender, age, and school type. The Respondent's gender is indicated in the Table 4.2 that follows.

Table 4.2

Gender Segmentation

Gender	Rate	Percentage (%)
Male students	197	49.7
Female students	199	50.3
Total	396	100.0

In Table 4.2 indicates that among the students that participated in the study, 197 (49.7 %) were boys and 199 students representing 50.3% were girls. This number represents the cumulative questionnaires that were properly filled out and categorised by the participants' gender. The results indicate that the number of girls who completely filled out and returned the questionnaires was slightly higher than that of male students. This suggests that the blank and inappropriately answered questionnaires were predominantly from male students.

4.3 Findings on the Relationship between Classroom Climate and Biology Achievement

This section, descriptive statistics of classroom climate in relation to students' Biology achievement is presented, testing of the hypothesis and discussion of the outcomes is also given.

4.3.1 Classroom Climate Descriptive Statistics

Table 4.3 indicates classroom climate descriptive statistics.

Table 4.3

Summary of Students' Responses to Statements on Classroom Climate

Item	Response A	U	D
The teacher is considerate of students' emotions	283 (71.5)	33 (8.3)	80 (20.2)
The teacher prioritise talking over listening.	118 (29.8)	39 (9.8)	239 (60.4)
The classroom is composed of students who are unfamiliar with each other.	91 (23.0)	26 (6.6)	279 (70.7)
The students look forward to coming to classes.	258 (65.1)	56 (14.1)	82 (20.7)
Students have knowledge of what has to be carried in our class.	315 (79.5)	38 (9.6)	43 (10.8)
New ideas are rarely tested out in our classroom	167 (42.2)	71 (17.9)	158 (39.9)
All learners in the class are believed to do the same task using the same methods and within the same timeframe.	222 (56.1)	35 (8.8)	139 (35.1)
The teacher talks individually with students.	218 (55.0)	42 (10.6)	136 (34.3)
Learners are diligent in their classwork.	305 (77)	46 (11.6)	45 (11.3)

All learners know their classmates by their first names.	274 (69.2)	31 (7.8)	90 (22.7)
Learners are displeased with the classroom activities.	120 (12.1)	74 (18.7)	202 (51)
Completing a specific workload is important in this class.	310 (78.3)	47 (11.9)	39 (9.9)
Novel and variant means of teaching are rarely tried in our classroom.	232 (58.6)	37 (9.3)	127 (32)
Students are often permitted to work at their own paces.	195 (49.3)	44 (11.1)	157 (39.7)
The instructor goes out of his/her way to assist learners.	315 (79.5)	33 (8.3)	48 (12.1)
Learners 'clock watch' in the class.	143 (36.1)	44 (11.1)	209 (52.7)
Students’ Friendships is practiced in our classroom.	340 (85.9)	24 (6.1)	32 (8.1)
Learners have a sense of fulfilment after the class session.	229 (57.8)	92 (23.2)	75 (18.9)
The group frequently loses focus and deviates from the main point.	117 (29.5)	111 (28.0)	168 (42.4)
The instructor devises creative activities for students carried out.	252 (63.7)	63 (15.9)	81 (20.4)
Students decides how class time is utilised.	204 (51.6)	64 (16.2)	128 (32.3)
The instructor assists every learner who is having difficulty with the work.	334 (84.4)	18 (4.5)	44 (11.1)
Class pays attention to what other students are communicating.	249 (63)	37 (9.3)	110 (27.8)
The class does not have much time to get to know each other.	89 (22.5)	46 (11.6)	261 (65.9)

Students have a view that classes are a waste of time.	28 (7.1)	24 (6.1)	344 (86.9)
The class is disorganised.	49 (12.3)	26 (6.6)	321 (81.0)
Approaches applied in teaching are variant, innovation and creative.	205 (51.8)	125 (31.6)	66 (16.7)
The class is permitted to select class activities and how to work them.	204 (51.5)	47 (11.9)	144 (36.4)
The instructor seldom walk around the classroom to interact with learners.	194 (49.0)	25 (6.3)	177 (44.7)
The class rarely present their assignments to the whole class.	149 (37.6)	53 (13.4)	194 (49.0)
Knowing everybody by his/her first name in this classroom takes long time.	76 (19.2)	45 (11.4)	275 (69.4)
Classes are boring.	46 (11.6)	36 (9.1)	314 (79.3)
Students' practice exercises are often clear, so that everyone understands how to work them.	282 (71.2)	41 (10.4)	73 (18.2)
Classroom seating arrangements is the same way every week.	271 (68.4)	23 (5.8)	102 (25.8)
Teaching methodologies allow the learners to work at their own pace.	192 (48.5)	79 (19.9)	125 (31.5)
The teachers are not interested in students' predicaments.	85 (21.4)	43 (10.9)	268 (67.6)
The class is presented with an opportunity to convey opinions in this class.	319 (80.6)	23 (5.8)	54 (13.6)
The class members get to acquit to each in class.	288 (72.7)	51 (12.9)	57 (14.4)
All students love coming to the classroom.	293 (74)	47 (11.9)	56 (14.2)
The class rarely starts in time.	197 (49.8)	35 (8.8)	163 (41.1)
Unusual class activities are often thought by the teacher.	88 (22.2)	115 (29.0)	193 (48.7)
There is little opportunity for the class to pursue their specific interest during class time.	120 (30.3)	59 (14.9)	216 (54.5)

The instructor is unapproachable and lack consideration toward learners.	79 (19.9)	33 (8.3)	284 (71.7)
The instructor leads most of the class discussions.	198 (50.1)	55 (13.9)	143 (36.1)
Learners in this class show little interest in getting to know their peers.	98 (24.8)	57 (14.4)	241 (60.9)
Classes are interesting.	310 (78.3)	39 (9.8)	47 (11.9)
Classroom activities are precisely and keenly orchestrated.	288 (72.7)	39 (9.8)	69 (17.5)
The class seems to participate in similar activities every class session.	118 (29.8)	60 (15.2)	218 (55.1)
What to be performed in our class is decide by the teacher.	247 (62.4)	41 (10.4)	108 (27.3)

Note. Percentages are indicated by the figures in brackets.

The participants gave their responses on a total of forty-nine statements as indicated in Table 4.3. Twenty statements were stated negatively while 29 statements were stated positively. In reference to the positive statements, 71.5 % of the respondents were in agreement that the teacher considers students' feelings, 8.3% were undecided. Only 20.2 % of the participants disagreed. This implies that most students that were engaged in the study were confident that teachers consider their feelings. A total of 258 students (65.1%) agreed that they look forward to coming to classes, 14.1% were undecided, 20.7% generally disagreed with this assertion. This suggest that the majority of students expressed confidence in enjoying their classes

Concerning the statement, students have knowledge of what has to be carried in our class, 79.5% of the students agreed, 9.6% were undecided, 10.8% disagreed with this statement. The findings reveal that most learners are confident that they are knowledgeable on what is precisely to be

carried in the classroom. Asked whether the class is permitted to proceed at their paces, 49.3% agreed 11.1 % were undecided, 39.7 % disagreed. Therefore, this pointed that a greater number of the students agreed that they are generally given an opportunity to proceed their work at their individual paces. In addition, the response on all learners in the class are believed to do the same task using the same methods and within the same timeframe indicated that 56.1% of the respondents agreed, 8.8% were undecided, 35.1% disagreed. This suggested that most students agreed that all class members should complete the same tasks in the same way and at the same time

Concerning the statement that the teacher chats with students individually, 55% agreed that it happens, 10.6% were undecided, 34.4% disagreed. Meaning that a majority of the students agreed on whether the teacher talks individually with students. On the statement that learners are diligent in their classwork, 77% agreed, 11.6% were undecided implying that majority of the learners were confident that they put effort into what they do in class.

Concerning the statement that all learners know their classmates by their first names, 69.2% agreed with this statement, 7.8% were undecided, 22,7% disagreed. This implies that most students were confident they know their classmates by their first names. On the statement that achieving doing some work is of significance in the classroom, 78.3% agreed, 11.9% were undecided, 9.9% disagreed, indicating that most students believed completing a specific workload was important for the class. Asked whether the instructor goes out of his/her way to assist learners, 79.5% agreed, 8.3% were undecided, 12.1% disagreed implying most students were confident that the tutor tasks himself/herself to helping students in class.

Further, 85.9% of the respondents were in agreement that friendships are achieved among students in the classroom, while 6.1% were undecided. Only 8.1% of the participants disagreed whereas, implying that most students that were engaged in the study were confident that friendships are attained among students in the classroom. In addition, a total of 229 students (57.8%) agreed that they are satisfied after class, 23.2% were undecided, 18.9% disagreed suggesting that most of the students were confident that they have some form of satisfaction after the class session.

Regarding the statement the instructor devises creative activities for students carried out, 63.7% of the students agreed, 15.9% were undecided, 9.3% disagreed with this while 20.4% greatly disagreed with the assertion. The results indicate that majority of the students are confident that the teacher is thoughtful of innovative duties to be carried up by students. When asked whether learners have an input pertaining the use of class time, 51.6% agreed, 16.2% were undecided, 32.3% disagreed, this implies that a high number of students were confident that they have an input pertaining the use of class time.

Asked whether the teacher lends a helping hand to each student portraying some difficulties in class work, 84.4% agreed, 4.5 % were undecided, 6.1 % disagreed and 11.1 % disagreed. Further, indicating that a greater number of students were confident that the instructor assists every learner who is having difficulty with the work. The responses on learners listen to what other are communicating, indicated that 63% of the respondents agreed, 9.3% were undecided, 27.8% disagreed. This suggests that most learners felt confident in their classmates' ability to listen attentively.

Concerning the statement that variety and innovativeness characterizes the teaching approaches applied in the class, 51.8% agreed that it happens, 31.6% were undecided, 16.7% disagreed. This is evidence that most learners perceived teaching methods in the class as innovative, creative and variant. On the statement that the class is permitted to select duties and how they will be carried out, 51.5% agreed, 11.9% were undecided, 36.4% disagreed pointing out that most students felt confident that the learners are permitted to choose activities and determine their approach.

Concerning class activities are elaborately clear such that each individual is aware how to proceed on, 71.2% greatly agreed with this statement, 10.4% were undecided, 18.2% disagreed implying most students were confident that activities in the class are clear such that each member knows how to proceed on. On the statement that the class arrangement is constant every week, 68.4% agreed, 5.8% were undecided, 25.8% disagreed, indicating the seating in this class is typically arranged in the same manner every week. Inquired whether the teaching methodologies allow the learners to work at their own pace, 48.5% agreed, 19.9% were undecided and 31.5% disagreed, implying that most learners were confident that the tutor provides assistance to the class.

Further, 80.6% of the respondents strongly agreed that learners had opportunities to share their views class, and 5.8% were undecided. Only 13.6% of the participants disagreed, implying that most students engaged in the study felt that the class provides a chance to express their views. Additionally, 288 students 72.7% agreed that learners in the class are familiar with one another,

and 12.9% were undecided. Further, 14.4% generally disagreed, suggesting that most learners were confident that they get to know each other well.

Concerning the statement that students enjoy going to this class, 74% of the students agreed, 11.9% were undecided, and 14.2% disagreed, indicating that majority of students felt confident that they enjoy going to the class. When asked whether the instructor frequently devises creative classroom activities, 22.2% agreed, 29.0% were undecided, and 48.7% strongly disagreed, implying that the majority of students were not confident that the teacher frequently thinks of unusual class activities. Asked whether the classes are interesting, 78.3% agreed, 9.8% were undecided, and 17.5% disagreed, indicating a large number of students felt the classes are interesting. Regarding the assertion that class activities are strategised with care and precision, 72.7% of the respondents agreed, 9.8% were undecided, and 17.5% disagreed, suggesting that majority of students felt the class activities are well-structured and planned.

Regarding the statement that it is the instructor who makes a decision on activities to be done in class, 62.4% agreed, 10.4% were undecided, and 27.3% disagreed, indicating that a majority of students agreed that it is the teacher who decides what will be done in the class. For the statement that the class does similar activities regularly, 29.8% agreed, 15.2% were undecided, and 55.1% disagreed, implying that the majority of learners were not confident that similar activities were regularly carried out in each class session.

On the negative statements, 71.5% of the students indicated that the teacher talks rather than listens, 9.8% were undecided, while 60.4% disagreed. The findings reveal that most respondents

perceived the instructor as listeners. Furthermore, 23% of the participants strongly affirmed that the class consists of students who are not well-acquainted with each other, 6.6% were undecided, while 70.7%. Results showed that most of the participants did not think that the class consists of learners who are unfamiliar with one another.

Asked whether novel ideas are rarely carried out in the classroom, 42.2% agreed, 17.9% were undecided, while 39.9% disagreed. On the other hand, 30.3% strongly agreed that the class is not satisfied with what is undertaken in the classroom, 18.7% were undecided, while 51% strongly agreed. These statistics show that most students have dissatisfaction with what is done in the class. Concerning the statement that various types of teaching methodologies are rarely applied in this classroom, 58.6% agreed with this statement, 9.3% were undecided, and 32% disagreed. Further, implying that most learners were confident that new and different teaching methods are rarely used in the class. On class clock watch, 36.1% agreed, 11.1% were undecided, also, while 52.7% strongly disagreed, indicating that generally most students have a low view that students 'clock watch' in the class. Asked whether the group frequently loses focus and deviates from the main point, 29.5% agreed, 28.0% were undecided, and 42.4% disagreed, indicating that most students generally have a low view that the group frequently loses focus and deviates from the main point.

22.5% of students indicated that learners have limited opportunity for them to become acquainted with each other in this class, 11.6% were undecided, while 65.9% strongly disagreed. The findings indicate that most of the participants did not believe that the class has limited opportunities to acquaint themselves with each other. Furthermore, 7.1% of the participants

strongly affirmed that classes are a waste of time, 6.1% were undecided, 86.9% disagreed while. The findings showed that most respondents did not think that attending class is pointless. Asked whether the class is disorganised, 12.3% of learners agreed, 6.6% of students were undecided, while 81% strongly disagreed. On the contrary, 49% strongly agreed that the tutor rarely walk around the class to converse with students, 6.3% were undecided, while 44.7% strongly agreed. These statistics show that most students have a strong view that the tutor rarely walks around the class to converse with learners. Concerning the statement that learners rarely present their assignments to the whole class, 37.6% of learners agreed, 13.4% were undecided, and 49% of Form Three learners strongly disagreed, revealing that most students were not confident that the class presentations were rarely done.

On the statement that to know every student by first name, it takes the class a long duration, 19.2% agreed, 11.4% were undecided, as opposed to 69.4% who robustly disagreed, indicating that, generally, most students have a low perception that it takes a long time to learn every student's first name in the class. Asked to identify whether classes are not interesting, 11.6% of students agreed, 9.1% were undecided, and 79.3% strongly disagreed, pointing that most students strongly disagreed with the statement that classes are boring. 21.4% of the students indicated that the teacher is not interested in their problems, 10.9% were undecided, 67.6% disagreed. The findings suggested that most participants did not believe the teacher is not interested in learners' problems. Further, 49.8% of the participants strongly affirmed that the class often starts late, 8.8% were undecided, while 41.1% strongly disagreed. Results indicated that majority of the respondents generally believed that class seldom starts on time.

Further, when asked whether learners in this class show little interest in getting to know their peers, 24.8% agreed, and 14.4% undecided. A larger proportion disagreed 60.9% disagreed, suggesting a general disagreement with the statement that students lack interest in building relationships within the class. Asked whether there is a dismal chance for the class to pursue their specific interest, 30.3% agreed, 14.9% were undecided, while 54.5% disagreed. Conversely, regarding teacher dominance in class discussions, 50.1% agreed, and 13.9% were uncertain. 36.1% disagreed, these statistics show that most students have a higher view that the teacher dominates class discussions. Concerning the statement that the teacher is unfriendly and inconsiderate toward students, 19.9% agreed that the teacher was unfriendly and inconsiderate, and 8.3% were undecided. However, the majority of students disagreed (71.7%) with this statement, indicating that most students did not perceive the teacher as unfriendly or inconsiderate.

Table 4.4 shows the descriptive statistics of classroom climate scores.

Table 4.4

Descriptive Statistics of Classroom Climate Scores

	N	Min	Max	Range	*Sk*	*Kur*
Classroom Climate	396	47	91	47	.129	.803

From Table 4.4, it is revealed that the highest classroom climate score and the lowest classroom climate score are 91 and 47 respectively meaning, the difference (range) between them is 47. The skewness and kurtosis coefficients were .129 and .803 respectively indicating a near normal distribution of the scores.

In addition, classroom climate scores were examined as per the different genders of student' as illustrated in Table 4.5 below.

Table 4.5

Classroom Climate Descriptive Statistics by Gender

Gender of Students	N	Mean	Std. Deviation	Min.	Max.	Range
Male	197	64.35	6.225	47	82	35
Female	199	63.63	5.611	48	91	43
Total	396	63.99	5.928	47	91	44

Outcomes in Table 4.5 show that the lowest score among the male participants was 47, and the highest was 82. The mean score was 64.35, with a standard deviation of 6.225. For female students, the lowest score for classroom climate was 48 while the highest score was 91. The classroom climate average score and standard deviation pertaining to female students were (M = 63.63, *SD* = 5.611). This implies that despite the fact that females recorded the highest classroom climate they collectively had a lower classroom climate compared to the boys.

The descriptive statistics of Classroom Climate scores by the school category are showed in Table 4.6.

Table 4.6

Classroom Climate Descriptive Statistics by School Category

Type of school	Mean	N	Std. Dev.	Min.	Max.	Range
Boys Boarding Schools	63.43	112	6.473	47	82	35
Girls Boarding Schools	63.09	88	5.935	48	91	43
Co-Educational Institutions	64.71	196	5.527	49	79	31
Total	63.99	396	5.928	47	91	44

The research outcomes in Table 4.6 indicate that boys' boarding institutions had a mean score of 63.43, with a standard deviation of 6.473; the mean score for girls' institutions was 63.09 (SD = 5.935), while that of co-educational institutions was 64.71 (SD = 5.527). Maximum classroom climate score for male boarding schools and female boarding schools was 82 and 91 respectively and that of co-educational institutions was 79. Minimum classroom climate score was 47 for male boarding, 48 female boarding schools and 49 for co-educational institutions. These statistics show that classroom climate was relatively related to the school types, with girls' boarding schools having the highest classroom climate score and co-educational institutions having the lowest classroom climate score. However, generally co-educational institutions

seemed to have a better classroom climate on average than boys and girls boarding schools. The researcher further categorised class climates according to levels displayed in Table 4.7.

Table 4.7

Classroom Climate Levels

Stage	N	Percentage
Supportive	222	56.1
Interactive	94	23.7
Respectful	80	20.2
Total	396	100

Table 4.7 revealed that a supportive classroom climate attracted 222 participants, representing 56.1%. This was followed by an interactive classroom climate, which was moderately prevalent with 94 participants supporting it, amounting to 23.7%. The least dominant classroom climate was respect, which attracted 80 participants and accounted for 20.2%. This implies that most respondents identified support as the main contributor to a positive classroom climate.

4.3.2 Biology Achievement Descriptive Statistics

Table 4.8 presents the descriptive statistics for the raw scores and standardized scores in Biology achievement

Table 4.8

Biology Achievement Raw Scores

	N	Range	Minimum	Maximum	Skewness	Kurtosis
Raw scores of Biology Achievement	396	92	1	93	.360	-.667
Standardized scores of Biology academic achievements	396	43.52	31.57	75.09	.360	-.667

Table 4.8 tabulates the Biology achievement raw scores and standardized scores. The lowest raw score was 1, while the highest was 93, resulting in a range of 92. The skewness and kurtosis coefficients were .360 and -.667 implying that distribution is approximately or nearly normal. Further, the descriptive statistics for standardised Biology scores suggests that the highest score was 75.09, and the lowest was 31.57, yielding a range of 43.52. The skewness and kurtosis coefficients remain at .360 and -.667 respectively. This confirms that the distribution was approximately normal.

Biology achievement scores were also categorised based on gender as tabulated in Table 4.9 below.

Table 4.9

Descriptive statistics for Biology achievement by gender

Gender of students	Mean	N	Std. Dev.	Min.	Max.	Range
Male	50.2604	197	9.93889	31.57	75.09	43.52
Female	49.7422	199	10.07854	32.04	72.25	40.20
Total	50.0000	396	10.00000	31.57	75.09	43.52

Table 4.9 shows that there were 199 female respondents and 197 male respondents. For the male respondents, the mean score was 50.26 with a standard deviation of 9.94. In contrast, female respondents had a mean score of 49.74 and a standard deviation of 10.08. The lowest score among male students was 31.57, while the highest was 75.09. For female students, the scores ranged from a minimum of 32.04 to a maximum of 72.25. Based on the average score per gender, the findings indicate that male students performed better than female students in Biology. However, the lowest mark in Biology was recorded by male students. The researcher further analysed the Biology achievement by school category. Table 4.10 provides the findings.

Table 4.10

Descriptive Statistics for Biology Achievement by School Category

School Type	Mean	N	Std. Devi.	Min.	Max.	Range
Boys Boarding Schools	55.0351	112	8.56362	36.77	75.09	38.31
Girls Boarding Schools	55.3821	88	8.73694	36.77	72.25	35.47
Co-Educational Institutions	44.7063	196	8.42392	31.57	72.25	40.68
Total	50.0000	396	10.00000	31.57	75.09	43.52

Findings in Table 4.10 point that boys' boarding schools had a mean of 55.0351 and standard deviation of 8.56362. Further, the mean score for girls boarding and co-educational institutions was 55.3821 and 44.7063 respectively. The lowest score for boys' boarding schools was 36.77 while the maximum score was 75.09. The highest score for girls' boarding school was 72.25 with a minimum score of 36.77. The highest score for co-educational institutions was 72.25 while the lowest score was 31.57. The findings indicate that girls' boarding schools performed better in Biology than all the other school categories.

The results in Biology achievement were further categorised into levels highlighted in the Table 4.11.

Table 4.11

Biology Achievement Levels

Levels	Frequency	Percent
Low	222	56.10
Moderate	94	23.70
High	80	20.20
Total	396	100.00

The statistics in Table 4.11, a greater proportion of the participants in the study precisely 56.1% recorded low scores in Biology achievement, 94 of the respondents representing 23.7% of the participants registered moderate scores whereas 80 of the participants representing 20.2% scored highly in Biology.

4.3.3 Hypothesis Testing

In determining if the relationship between classroom climate and Biology achievement was significant. Hypothesis that follows was examined.

H_{01} There is no statistical significant relationship between classroom climate and Biology achievement.

The Pearson correlation coefficient was used to test the hypothesis, and the results are displayed in Table 4.12

Table 4.12

Relationship between Classroom Climate levels and Biology Academic Achievement

		Biology Achievement
Classroom Climate	Pearson Correlation	-.103*
	Sig. (2-tailed)	.41
	N	396

* This relationship is significant at the 0.05 level (two-tailed).

The researcher hypothesised, there was no significant relationship between classroom climate and Biology achievement. However, the Pearson correlation analysis indicated a negative and significant relationship between classroom climate and Biology achievement, with r (396) = -0.103, p < 0.41, leading to the null hypothesis being rejected. This implies that the relationship between classroom climate and the Biology achievement was generally an inverse relationship. Therefore those students achieving highly in Biology may not experience better classroom climate than those who are performing poorly in Biology.

Table 4.13

Levels of Classroom Climate and Biology Mean Scores

Level of Classroom Climate	N	Biology Mean	*SD*
Supportive	222	65.54	8.303
Interactive	94	65.95	7.934
Respectful	80	61.34	9.400

From the results given in Table 4.13, a supportive classroom climate was associated with a Biology mean score of 65.54 and a standard deviation of 8.303 among students, while an interactive classroom climate had a mean score of 65.95 and a standard deviation of 7.934. In comparison, a respectful classroom climate was associated with an average score of 61.34 and a standard deviation of 9.400, pointing that the interactive classroom climate resulted in higher Biology achievement among students

4.3.4 Discussion of the Results

This study identified a significant relationship between classroom climate and Biology academic achievement. This suggests that a classroom climate characterised by respect, support, and interactions is likely to influence scores in Biology. The findings support those of other researchers in past studies conducted in this area. Ma and Wei (2022) pointed out that academic achievement was significantly affected by the classroom environment. Their study involved teacher trainees pursuing English as a major in Guangxi, China. Data from the students were collected via questionnaires and then analysed. The outcomes from the research indicated that classroom climate was positively correlated with the academic achievement of teacher trainees, implying that the higher the perceived classroom climate, the higher the academic achievement. The study further identifies classroom climate as a strong predictor of students' achievements.

Further, Kalkan and Dağlı (2021) found results similar to the current study's findings. The study investigated the correlation between classroom climates, school belonging, and academic performance in Turkey. Data collected using questionnaires were analysed, and the Pearson's correlation was $r\ (667) = .367$, $p < .05$. The results showed that secondary school learners' understanding of classroom climate and school belonging is at a high level. Also, the study's

results showed a significant relationship between classroom climate and academic achievement, implying that both classroom climate and school belonging are important predictors of academic success. In addition to the physical characteristics of the class, the quality of the class environment was found to be determined by the quality of the relations between the individuals in the class, that is, an interactive classroom climate within the class.

Contrary findings to this study were arrived at by Randjelovic and Dimić (2020). In examining the correlation between academic achievement and components of classroom climate of teacher-student interactions, emotional climate, social climate, and fear of failure in Malaysia. The results revealed that the relationship between the dimensions of classroom climate and academic achievement is not significant. Moreover, consistent with the current study, it was found that students of a younger age had better scores pertaining to the teacher-student interaction dimension than those older in age.

Consistent findings have also been reported in the African context. Ekpo et al. (2019) asserted that there is correlation between classroom climate and students' academic achievement in Social Studies, across three Educational Zones within the State Secondary Education Board of Cross River State, Nigeria. The researcher examined various sub-variables of classroom climate in this study, including the physical layout of the classroom, teachers' instructional behaviours, and the use of instructional materials. The study established that the classroom climate variables mentioned jointly contributed to the variance in students' academic achievement in Social Studies.

A survey in Kenya by Rutto (2017) reported similar findings on the relationship between classroom environment and learners' academic scores in Chemistry. The Pearson product-moment correlation analysis showed a significant relationship between students' perceptions of the classroom psychosocial environment and their academic performance in Chemistry. In addition, learners understanding of the psychosocial environment in the Chemistry classroom were linked to their academic performance. The classroom environment is recognised as a crucial factor in student learning and should be managed by both teachers and students to ensure high academic achievement. Moreover, the study established that adjusting elements of the classroom environment can enhance student learning. This can be achieved by encouraging cohesive, cooperative, and task-focused classroom settings.

4.4 Findings on the relationship between academic buoyancy and Biology academic achievement

The second objective of the study was to investigate the relationship between academic buoyancy and Biology achievement among students. This scale was used because it tries to identity all aspects of academic buoyancy among participants.

4.4.1 Academic buoyancy statistical summary

Table 4.14 presents the summary responses to statements on academic buoyancy.

Table 4.14

Summary of Responses to Statements on academic buoyancy

Statement	**SA**	**U**	**SD**
I don't let stress overwhelm me.	306 (77.3)	23 (5.8)	67 (16.9)
I am good in dealing with schoolwork pressures	250 (63.1)	51 (12.9)	95 (24)
A poor mark does not have an impact on my confidence	302 (76.3)	29 (7.3)	65 (16.5)
I handle setbacks, like receiving negative feedback on my work, effectively.	260 (65.6)	49 (12.4)	87 (22)
I feel embarrassed when I get poor results in a biology test.	312 (78.8)	17 (4.3)	67(16.9)
I doubt my chances of succeeding in Biology tests	122 (30.8)	33 (8.3)	241 (60.8)
I would try to think of new solutions	362 (91.4)	9 (2.3)	25 (6.3)
I would use my past successes to help motivate myself.	358 (90.4)	13 (3.3)	25 (6.3)
I would set my own goals for achievements.	360 (90.9)	9 (2.3)	27 (6.8)
I would see any situation as a challenge	199 (50.2)	36 (9.1)	161 (40.7)
I would do my best to stop thinking negative thoughts	322 (81.4)	17 (4.3)	57 (14.4)
I would not accept my teacher's feedback	86 (20.7)	42 (10.6)	272 (68.7)

I would use the teacher's feedback to improve my exam achievement in Biology	347 (87.6)	11 (2.8)	38 (9.6)
I would keep trying	351 (88.6)	12 (3.0)	33 (8.3)
I would prevent myself from freaking out	309 (78)	27 (6.8)	60 (15.1)
I would explore various ways for learning Biology.	356 (89.9)	13 (3.3)	27 (6.8)

From Table 4.15, the participants gave their responses on a total of sixteen statements. Two statements were negatively stated, while 14 statements were positively stated. In reference to the positive statements, 77.3% of the respondents were in agreement that they do not let stress overwhelm me, and 5.8% were undecided. Only 16.9 % of the participants disagreed, this implies that most students who participated in the study were confident that they do not let stress overwhelm them. A total of 250 students (63.1%) agreed that they are good in dealing with schoolwork pressures, 12.9% were undecided, and 24 disagreed, suggesting that most of students were confident in their ability to handle schoolwork pressures.

Concerning the statement that the student's confidence is not affected by poor marks, 76.3% of the learners agreed, 7.3% were undecided, and 16.5% disagreed, indicating that the majority of students believe their confidence is not affected by poor marks. Additionally, the responses on that students are good in dealing with setbacks, such as negative feedback on their work, indicated that 65.6% of participants agreed, 12.4% were undecided, and 22% disagreed, this suggest that the majority of students are confident in their ability to handle setbacks, including negative feedback on their work.

Asked whether students feel embarrassed when they get poor results in a biology test, A majority of 78.8% agreed. A small percentage (4.3%) remained undecided, with 16.9% disagreeing. This reveals that majority of students were confident that they feel embarrassed when they get poor results in a Biology test. A significant majority of 91.4% strongly agreed that students would seek new solutions. A smaller portion of respondents were undecided (2.3%), while 6.3% disagreed, suggesting that most students believed they would actively seek new solutions.

Concerning the statement that students would use their past successes to help motivate themselves, 90.4% agreed that it happens, 3.3% were undecided, but 6.3 % disagreed, indicating that most students believed they would utilize past successes as motivation. On the statement that students would set their own goals for achievements, majority of 90.9% agreed with the statement. A smaller portion of respondents were undecided (2.3%), and 6.8% disagreeing, meaning that majority of the learners were confident that they would set their own goals for achievements. Concerning the statement that students would see any situation as a challenge, 50.2% agreed with this statement, 9.1% were undecided, and 40.7% disagreed, implying that most students were confident they would see any situation as a challenge.

On the statement that students would do their best to stop thinking negative thoughts, majority of 81.4% agreed with the statement. A smaller percentage of 4.3% were undecided, and with 14.4% disagreeing, indicating that generally most students would do their best to stop thinking negative thoughts. Asked whether the students would use the teacher's feedback to improve their exam achievement in Biology, 87.6% agreed. In addition, 2.8% were undecided, and 9.6% disagreed,

pointing that most students were confident that they would use the teacher's feedback to improve their exam achievement in Biology.

A total of 88.6% of the respondents agreed that they would keep trying, while 3.0% were undecided. Only 8.3% of participants disagreed, implying that most students in the study were confident that they would keep trying. Additionally, 309 students representing 78% strongly agreed that they would stop themselves from panicking, 6.8% were undecided, and 15.1% disagreed with this assertion, suggesting that most students were confident in their ability to prevent themselves from panicking. Regarding the statement that students would try different ways to study Biology, 89.9% of the learners agreed, 3.3% were undecided, and 6.8% disagreed. The results indicate that the majority of students are confident that they would try different ways to study Biology.

Regarding the negative statements, 30.8% strongly agreed that they doubt their chances of succeeding in Biology tests, and 8.3% were undecided. Moreover, 60.8% disagreed. The findings indicated that the majority of students did not doubt their chances of succeeding in Biology tests. Regarding the statement that students would not accept their teacher's feedback. Minority of respondents 20.7% agreed with the statement. Another 10.6% were undecided. However, the majority 68.7% expressed disagreement, further supporting the overall negative sentiment towards the statement. This implies that a greater percentage of students were confident that they would accept their teacher's feedback.

Table 4.15 displays the academic buoyancy scores.

Table 4.15

Descriptive Statistics of Academic Buoyancy Scores

	N	Min	Max	Range	Mean	*SD*	*Sk*	*Kur*
Academic Buoyancy	396	25	100	75	80.25	11.811	-1.421	3.162

Table 4.15 reveals that academic buoyancy scores ranged from a minimum of 25 to a maximum of 100, with an average score of 80.25 and a standard deviation of 11.811. The skewness and kurtosis coefficients were -1.421 and 3.162, respectively, indicating a negatively skewed distribution. In addition, from the mean it can be inferred that a large percentage of the respondents had high academic buoyancy.

In addition, academic buoyancy scores were examined as per the different gender of students' as illustrated in Table 4.16.

Table 4.16

Gender-Based Academic Buoyancy Scores

Students gender	Mean	N	Std. Devi.	Min.	Max.	Range
Male	80.38	197	11.737	25	100	75
Female	80.11	199	11.912	33	100	68
Total	80.25	396	11.811	25	100	75

Table 4.16 shows that male participants' academic buoyancy scores ranged from a minimum of 25 to a maximum of 100. The average and standard deviation for male students were (M = 80.38, *SD* = 11.737). Female students achieved academic buoyancy scores ranging from a minimum of 33 to a maximum of 100, with an average score of 80.11 and a standard deviation of 11.737. This implies that although female students had a higher lower-bound score for academic buoyancy, their male counterparts had a slightly higher average academic buoyancy on overall. The descriptive statistics of academic buoyancy scores based on school category are shown in Table 4.17.

Table 4.17

Academic Buoyancy by School Type

School Type	Mean	N	Std. Devi.	Min.	Max.	Range
Boys Boarding Schools	80.54	112	10.377	25	100	75
Girls Boarding Schools	79.96	88	12.299	33	100	68
Co-Educational Institutions	80.21	196	12.398	34	100	66
Total	80.25	396	11.811	25	100	75

Outcomes in Table 4.17 indicate that boys' boarding institutions had an average score of 80.54 with a standard deviation of 10.377, that of girls was (M = 79.96, *SD* = 12.299) while that of co-educational institutions was (M = 80.21, *SD* = 12.398). Maximum academic buoyancy score for male boarding schools, female boarding schools and co-educational institutions was 100. Minimum academic buoyancy score was 25 for male boarding, 33 female boarding schools and 34 for co-educational institutions. These statistics indicate that academic buoyancy varied based

on school type, with boys' boarding schools having the highest average score and girls' boarding schools having the lowest. Co-educational institutions had moderate academic buoyancy scores. The researcher further categorised academic buoyancy according to levels, as tabulated in Table 4.18.

Table 4.18

Academic Buoyancy Stages

Level	N	Mean	Percentage of Students
High Academic Buoyancy	386	84.14	97.5
Low Academic Buoyancy	10	43.7	2.5
Total	396	80.25	100

From the Table 4.18, it is revealed that most respondents 97.5% had a high academic buoyancy as compared to 2.5% that had a low academic buoyancy. Academic buoyancy mean score of the 386 participants that had a high academic buoyancy was 84.14 while the academic buoyancy mean score of 10 participants that had low academic buoyancy was 43.7. These statistics implies that majority of the respondents had a higher academic buoyancy.

4.4.2 Hypothesis Testing

In determining the relationship between academic buoyancy and Biology achievement, the following hypothesis was formulated.

H_{02} There is insignificant variations between academic Buoyancy and students' achievement in Biology.

This was investigated through the Pearson's correlation and findings are indicated in Table 4.19.

Table 4.19

Relationship between Academic Buoyancy and Biology Achievement

		Biology Achievement
Academic Buoyancy	Pearson Correlation	.072
	Sig. (2-tailed)	.151
	N	396

The researcher hypothesised that academic buoyancy and Biology achievement were not significantly correlated. The variables were evaluated using Pearson correlation coefficient, and results revealed that there was no significant correlation that was found out between academic buoyancy and Biology achievement thereby the null hypothesis is accepted ($r(396)=.072$, $p>.05$). This implies that academic buoyancy does not have any significant influence on the Biology achievement of the students.

4.4.3 Findings Discussion

In the second objective, the researcher aimed to determine whether a significant correlation existed between academic buoyancy and Biology achievement. However, the results suggested that academic buoyancy had no significant correlation with Biology achievement. These findings suggest that there is no significant relationship between students' levels of academic buoyancy, regardless of whether they are high or low, and their Biology academic achievement.

The results of the study revealed no significant correlation between academic buoyancy and Biology performance. The results align with a previous study conducted by Martin and Marsh in 2008. A null hypothesis was proposed, suggesting that there is no substantial correlation between academic buoyancy and students' achievement. Data were collected via questionnaires and

analysed. The results showed that while low academic buoyancy predicted lower subsequent academic performance, high academic achievement did not necessarily lead to increased academic buoyancy. Therefore, the null hypothesis was rejected, and the research findings indicate no significant correlation between academic buoyancy and Biology achievement.

Phillip (2019) opines that lack of significant correlation between academic buoyancy and academic achievement. The study, which involved a total of 663 students from various schools, used an academic buoyancy scale as a method of data collection. Analysis of the recorded data indicated that academic buoyancy varied among the different students involved in the study, and this variation was also observed across different genders. However, the study found that the ability of junior school students to respond to academic setbacks, known as academic buoyancy was not a predictor of academic achievement. Therefore,–academic buoyancy was not a significant predictor of academic achievement.

In contrast to the present study's results, Gazki and Delavar (2019) investigated the relationship between academic buoyancy and academic achievement among Turkish secondary school students. Their research investigated various components of academic buoyancy, such as academic commitment, academic investment, and academic satisfaction. Structured questionnaires were used to gather information. In addition, the analysis was conducted through factor analysis and Spearman's rank correlation test. The study found a significant correlation between academic buoyancy and academic achievement ($r = 0.132$, $p \leq 0.01$), indicating that students with higher levels of academic buoyancy tended to achieve higher academic grades.

The results of this research align with the findings of a survey conducted by Collie (2014) in Nigeria. The study sought to explore whether additional constructs could connect academic buoyancy and student achievement. A cross-lagged panel design was employed in Phase 1 to determine the causal relationships among academic buoyancy, control, and achievement. In Phase 2, an ordered process model was used to examine these constructs longitudinally. Pearson's correlation analysis was conducted to assess the relationships between the variables. The findings indicated a connection between academic buoyancy and control over time, but no direct relationship was found between academic buoyancy and academic achievement. This implies that students with higher academic buoyancy do not necessarily achieve higher academic scores, and vice versa.

In Kenya, a study by Stella and Theresia (2023) revealed a significant connection between academic buoyancy and academic motivation. The study employed scales to collect data from participants and aimed to examine whether academic mindsets and academic buoyancy were related to and predicted academic motivation among secondary school students. The findings revealed that both academic mindsets and academic buoyancy had a strong and meaningful correlation with academic motivation. Additionally, the research found that academic mindsets, and academic buoyancy predicted academic achievement among secondary school students. This implies that higher academic buoyancy results in higher academic motivation, which in turn leads to higher achievement among students.

4.5 Findings on the gender differences in classroom climate and academic buoyancy on Biology achievement

In the 3rd objective, the research intended to find the gender variations in classroom climates and academic buoyancy on Biology achievement among the Form Three students.

4.5.1 Gender-based comparison of classroom and academic achievement

Table 4.20 presents descriptive outcome of gender variations in classroom climate and academic buoyancy.

Table 4.20

Gender Differences in Classroom Climate and Academic Buoyancy

Gender of students		Classroom Climate Score	Academic Buoyancy Score
Male	Mean	50.6066	50.1139
	N	197	197
	Std. Deviation	10.50114	9.93704
Female	Mean	49.3995	49.8873
	N	199	199
	Std. Deviation	9.46606	10.08573
Total	Mean	50.0000	50.0000
	N	396	396
	Std. Deviation	10.00000	10.00000

From Table 4.20, it is indicated a total of 199 girls and 197 boys participated in study as respondents. Male students averaged a classroom climate score of 50.61 with a standard deviation of 10.50, and an academic buoyancy score of 50.11 with a standard deviation of 9.94. In contrast, female students averaged a classroom climate score of 49.40 with a standard deviation of 9.47, and an academic buoyancy score of 49.89 with a standard deviation of 10.09. From the findings it was revealed that most male respondents maintained a higher classroom climate score as compared to their academic buoyancy. This implies that male students prefer to have a proper classroom climate as compared to their academic buoyancy. In addition, the outcome revealed that female respondents had a higher academic buoyancy score as compared to

their classroom climate. This implies that for female students higher academic buoyancy was more prevalent than proper classroom climate.

4.5.2 Gender-Based Comparison of Classroom, Academic Buoyancy, and Biology Achievement

Table 4.21 presents standardised gender-specific data analysis variations in classroom climate and academic buoyancy on Biology achievement.

Table 4.21

Gender Differences in Classroom Climate and Academic Buoyancy on Biology Achievement

Gender of students		Biology Achievement Standardized Scores	Academic Buoyancy Standardized Scores	Classroom Climate Standardized Scores
Male	Mean	50.2604	50.1139	50.6066
	N	197	197	197
	Std. Deviation	9.93889	9.93704	10.50114
Female	Mean	49.7422	49.8873	49.3995
	N	199	199	199
	Std. Deviation	10.07854	10.08573	9.46606
Total	Mean	50.0000	50.0000	50.0000
	N	396	396	396
	Std. Deviation	10.00000	10.00000	10.00000

Table 4.21 shows that male students had an average classroom climate score of 50.61 with a standard deviation of 10.50, (M = 50.1139, SD = 9.93704) in academic buoyancy, and (M = 50.2604, SD = 9.93889) in Biology achievement. In contrast, female students had mean scores and standard deviations of (M = 49.3995, SD = 9.46606) in classroom climate, (M = 49.8873, SD = 10.08573) in academic buoyancy, and (M = 49.7422, SD = 10.07854) in Biology

achievement. The findings reveal that male respondents had a higher classroom climate score compared to their academic buoyancy and achieved better in Biology than female students. This suggests that male respondents recorded higher achievement in Biology and preferred a more conducive classroom climate compared to their academic buoyancy scores. Conversely, female respondents showed lower academic achievement and higher academic buoyancy scores relative to their classroom climate scores. This implies that for female students, higher academic buoyancy was more prevalent than an optimal classroom climate, but they achieved slightly lower scores in Biology compared to male students.

4.5.3 Hypothesis Testing

In order to establish existence of any significant gender differences in classroom climate and academic buoyancy on Biology achievement the following hypothesis was formulated.

H_{03} There were no any statistically significant gender variations in classroom climate and students' academic buoyancy on Biology academic achievement among Form Three students.

Multiple regression analysis was used to test the hypothesis, and the results are presented in Table 4.22

Table 4.22

Model Summary for Predicting Gender differences

Gender of students	Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	Durbin-Watson
Male	1	.200[a]	.040	.030	20.692	.040	.721
Female	1	.067[a]	.004	-.006	21.369	.004	.935

Table 4.22 indicates that the Durbin-Watson value was .721. This suggests that the data did not meet the assumption of independence of observations. According to Tabachnick and Fidell (2019), the assumption for independent errors should range from 1.5 to 2.5. Therefore, our data violated this assumption. However, there were significant differences in males, but no significant differences were observed in female students.

Table 4.23 presents the regression coefficients

Table 4.23

Regression Coefficients

Gender of students	Model		Unstandardised Coefficients		Standardised Coefficients		
			B	Std. Error	Beta	T	Sig.
Male	1	(Constant)	42.749	9.893		4.321	.000
		Classroom Climate	-.327	.142	-.164	-2.311	.022
		Academic Buoyancy	.286	.150	.135	1.911	.058
Female	1	(Constant)	42.513	10.530		4.037	.000
		Classroom Climate	-.136	.161	-.061	-.845	.399
		Academic Buoyancy	.073	.151	.034	.481	.631

a. Dependent Variable: Biology academic achievement

C-Classroom Climate, A-Academic Buoyancy, M-Regression equation for male students and F-Regression equation for Female students based on Table 4.24 the equations predicting Biology achievement for male and female participants from classroom climate and academic buoyancy are;

M =-0.327C+0.286A+42.749

F =-0.136C+.073A+42.513

The results revealed that academic buoyancy had the highest predictive index for Biology achievement for male students. Classroom climate had the lowest and negative predictive index on Biology achievement. In considering female students alone, results revealed that academic buoyancy had the highest predictive index for Biology achievement. This was lower compared to that of male students. Therefore, the null hypothesis was rejected. The multiple regression equations show that both classroom climate and academic buoyancy predict Biology achievement to a significant extent in both female and male students. Academic buoyancy predicted Biology achievement more strongly in male students than in female students, while classroom climate predicted Biology achievement more strongly in female students than in male students.

4.5.4 Discussion of results

In the third objective, the researcher hypothesised that gender variations in classroom climate and academic buoyancy would not be significant. The results of the multiple regression analysis reveal that classroom climate and academic buoyancy both had a significant impact on students' academic achievement in Biology, irrespective of gender. Male students exhibited a better classroom climate and higher academic buoyancy, which contributed to increased academic achievement in Biology. Additionally, the results indicated a consistent predictive relationship between classroom climate, academic buoyancy, and Biology achievement. It was observed that academic buoyancy had the highest predictive index for Biology achievement, followed by classroom climate, for both genders. Generally, academic buoyancy displayed a positive variation, while classroom climate showed a negative variation in Biology achievement for both male and female students; therefore, the null hypothesis was rejected.

Regarding classroom climate, Kalkan and Dağlı (2021) noted that the correlation between classroom climate and learners achievement generally depicted a significant predictive index. Learners who experienced a positive classroom environment demonstrated higher academic performance, including in Biology, compared to their peers with poor classrooms climate. This is attributed to the fact that higher classroom climate scores indicate greater efforts by students in their studies. Similar findings, which show that classroom climate has a significant predictive index on academic achievement, are also reported by Ekpo et al. (2019).

Similarly, Hoferichter et al. (2021) report that academic buoyancy and classroom climate are significant predictors of academic well-being. The study examined how high academic buoyancy and a supportive class and school climate can buffer against declines in academic well-being among 1,024 Finnish junior secondary school students in grades 7 to 9. Gender and other factors, such as the ability to think logically and solve problems, and parental education were controlled. The findings of the structural equation modelling revealed that academic buoyancy significantly predicted students' satisfaction with school, while both classroom and school climate significantly influenced overall academic performance. The study highlights the importance of both classroom climate and academic buoyancy for academic well-being across genders.

The current research results corroborate the findings of Gazki and Delavar (2019) from a study conducted among Turkish students. The research pointed gender differences in both academic buoyancy and Biology achievement, indicating that students' academic buoyancy significantly contributes to their level of Biology performance. The study argues that a student's Biology achievement aligns with their individual characteristics, particularly academic buoyancy. There

was a significant difference in academic buoyancy between male and female students in the study

Similarly, Aloka (2023) in Kenya reported significant gender differences in academic buoyancy in relation to academic achievement. The researcher examined gender variations in academic buoyancy among first-semester undergraduate students at a public university. Academic buoyancy data was collected using the academic buoyancy scale, and an independent t-test was utilised to analyse the data. The findings revealed that the gender variations in academic buoyancy scores for boys and girls were statistically significant [$t\ (211) = -5.178$, $p < .001$]. Additionally, female students recorded lower academic buoyancy than their male counterparts.

The present study's findings, however, contrast with some previous studies on gender differences in academic buoyancy on Biology achievement. Zhao et al. (2023) found no significant relationship between classroom climate and academic achievement. This study aims to investigate the mediating and moderating roles of learning adaptability and teacher support in the relationship between classroom climate and achievement among left-behind children. Additionally, it explored gender variations in classroom climate and academic achievement in Chinese institutions. The data revealed no significant gender differences in school climate, learning adaptability, or academic achievement.

The findings indicate that irrespective of gender or school category, classroom climate and academic buoyancy, significantly affects Biology achievement among students. Poor Biology achievement in Juja Sub-County, therefore, maybe attributed to high or low classroom climate

and academic buoyancy among students. The gender difference in classroom climate and academic buoyancy and their potential effect on Biology academic achievement cannot be overemphasised, particularly academic buoyancy was the highest predictor and classroom climate the lowest predictor of academic achievement. However, academic buoyancy was higher in boys than girls while classroom climate score was greater in female than male students.

4.6 The Findings on the predictive weight between classroom climate, academic buoyancy and Biology achievement

This section presents regression analysis tests, testing of the hypothesis and results discussion.

4.6.1 Test for Assumptions of Regression Analysis

Heteroscedasticity and homoscedasticity assumptions was evaluated by scatter plots and results presented in Figure 4.1.

Figure 4.1

Scatter Plot for Observed Cumulative Probabilities and Expected Cumulative Probabilities

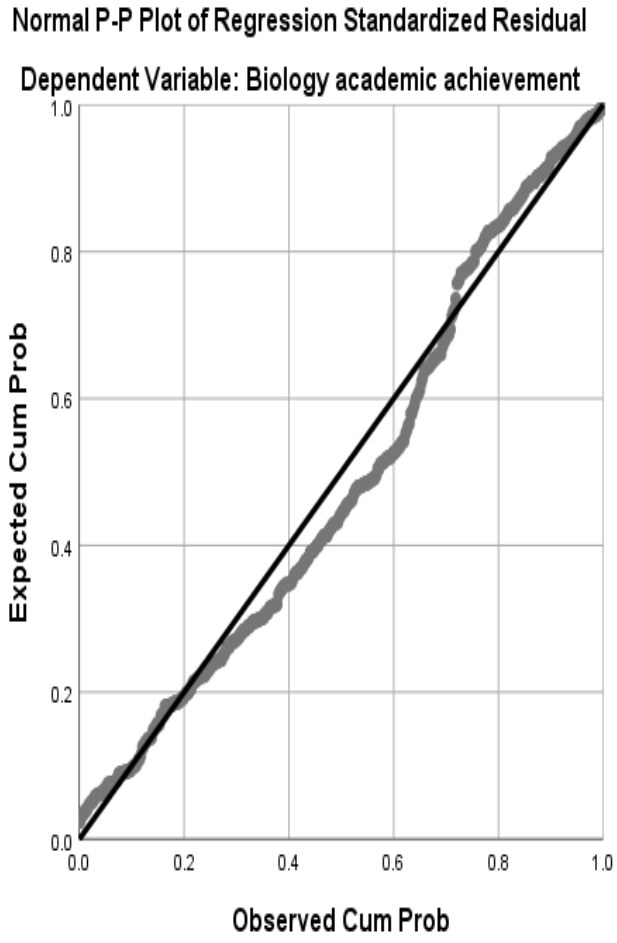

Figure 4.1 indicates that the scatter plot formed a definite pattern, implying that the data from the study was equally distributed. In addition, the error were spread out consistently between the predictor variables, indicating the heteroscedastic assumption of equal variance of outcome variables.

Also, normal distribution error was tested, a histogram was used to test the assumption as displayed in Figure 4.2.

Figure 4.2

Scatter Plot for testing normality distribution

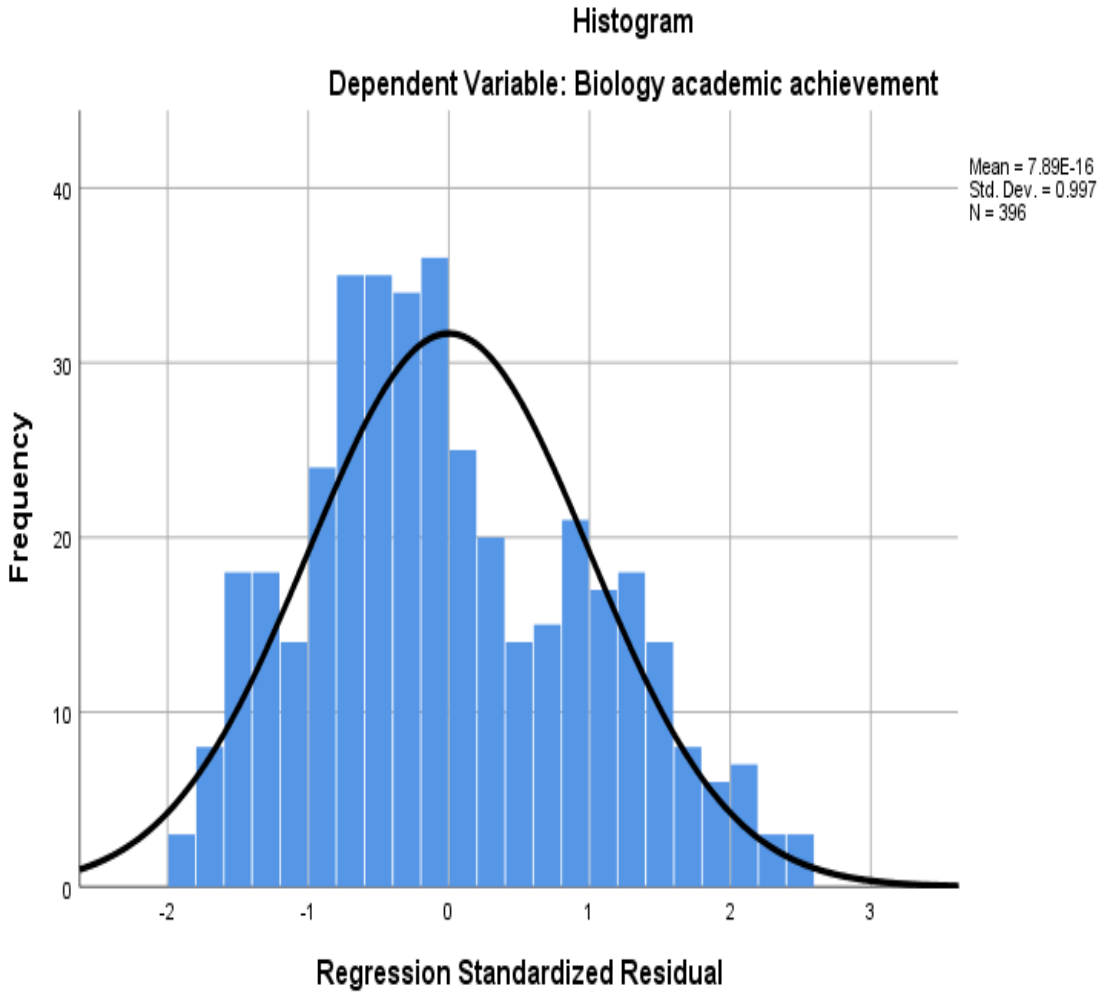

Figure 4.2 shows the normality test results. This points that classroom climate and academic buoyancy were approximately normally distributed.

Table 4.24 indicates the assumptions regarding multi-collinearity and singularity

Table 4.24

Assumptions regarding Multi-Collinearity and Singularity

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions (Constant)	Academic Buoyancy	Support	Interaction	Respect

1	1	4.941	1.000	.00	.00	.00	.00	.00
	2	.033	12.152	.00	.87	.02	.01	.06
	3	.012	20.079	.04	.07	.00	.31	.69
	4	.007	26.028	.01	.00	.94	.25	.21
	5	.006	29.695	.95	.06	.04	.44	.03

a. Dependent Variable: T-score: Biology achievement

Findings in Table 4.24 indicate that values that are $p<.05$ significantly predicted academic scores in Biology, while those that did not meet this criterion did not significantly predict Biology academic achievement.

4.6.2 Hypothesis Testing

In establishing the presence of any predictive weight between classroom climate and Biology achievement, the following hypothesis was formulated.

H_{04} There were no predictive weight between classroom climate and academic buoyancy on Biology academic achievement.

Regression analysis was applied in testing the hypothesis.

Table 4.25 presents model summary for predicting Biology achievement.

Table 4.25

Summary of the Model for Predicting Biology Achievement

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.157[a]	.025	.015	9.92566	.806

a. Predictors: (Constant), Classroom climate (Respectful, interactive and supportive), Academic Buoyancy.

b. Dependent Variable: T-score: Biology academic achievement.

Table 4.25 above indicates that the Durbin-Watson value was .814. This suggests that the data did not meet assumption of the independence of observations. According to Tabachnick & Fidell (2019), assumption for independent errors should range from 1.5-2.5. Thereby, our data violated the assumption for independent errors.

Table 4.26 indicates the regression coefficients

Table 4.26

Regression Coefficients

Model		Unstandardised Coefficients		Standardised Coefficients		
		B	Std. Error	Beta	T	Sig.
1	(Constant)	57.339	5.796		9.893	.000
	Academic Buoyancy	.083	.050	.083	1.643	.101
	Supportive Classroom Climate	-.016	.007	-.135	-2.277	.023
	Interactive Classroom Climate	.002	.007	.016	.298	.766
	Respectful Classroom Climate	-.002	.006	-.020	-.358	.720

A- Academic Buoyancy, S- Supportive Classroom Climate, I- Interactive Classroom Climate, R- Respectful Classroom Climate and ŷ- Biology Achievement

Based on Table 4.26, the equation predicting Biology achievement from classroom climate and academic buoyancy is;

$\hat{y}$ =0.083A-0.016S+0.002I-0.002R+57.339

The results reveal that academic buoyancy had the highest predictive index for Biology achievement followed by interactive classroom climate then, respectful and supportive classroom climates. Academic buoyancy and interactive classroom climate as variables displayed positive variation in Biology achievement while respectful and supportive classroom climates displayed negative variations in Biology achievement and, therefore, rejection of the null hypothesis was sustained. Further, it can be seen that classroom climate and academic buoyancy predicts Biology achievement from the multiple regression expression. However, the equation indicates academic buoyancy had the highest predictive index on Biology academic achievement and among classroom climate levels, interactive classroom climate had the highest predictive index on Biology performance.

4.6.3 Discussion of findings

The fourth objective, the researcher hypothesised that classroom climate and academic buoyancy had no significant relationship with Biology achievement. Findings indicate that classroom climate and academic buoyancy significantly affected students' Biology academic achievement from the multiple regression results. Students with higher academic buoyancy achieved better Biology scores. However, most relationships between classroom climate and Biology achievement were significant but negative with only interactive classroom climate having a significant positive correlation with Biology achievement.

Additionally, results indicate a consistent predictive index of Biology achievement from academic buoyancy and classroom climate. It was observed that academic buoyancy had the highest predictive index for Biology achievement, followed by interactive classroom climate, with respectful and supportive classroom climates having the lowest predictive index. Academic

buoyancy and interactive classroom climate had a positive variation in Biology achievement, whereas supportive and respectful classroom climates had a negative variation, indicating an inverse relationship between them and Biology achievement.

Regarding the predictive weight of classroom climate on academic achievement, Malone et al. (2018) investigated the effects of classroom climate, learners' engagement, and academic performance. The outcomes indicated that, generally, classroom climate was a significant predictor of students' academic achievement. Those students with strong classroom climate skills scored better academically compared to students with poor classroom climate. This is attributed to the fact that higher classroom climate scores are an indication of the students' devoted efforts in their interaction, support, and respect. Classroom climate is a significant predictor of academic achievement Tenaw (2013).

The present study results support the findings reported by Colonar et al. (2019) in research involving secondary school learners conducted in Sydney. The findings revealed that academic buoyancy and students' academic achievement were significant. Furthermore, academic buoyancy contributed significantly to academic achievement. The findings also indicated that academic buoyancy aligns with students' personal characteristics. Additionally, the results showed that mathematics achievement is significantly correlated with the academic buoyancy of lower-grade learners compared to upper-grade students.

Similarly, Hoferichter et al. (2021) report that classroom climate and academic buoyancy significantly predict academic performance. This study investigated the influence of a supportive

class, academic buoyancy, and students' institutional climate on high school students and conducted a longitudinal study to collect statistical data. From the responses to questionnaires issued to the participants, the outcomes showed that classroom climate and academic buoyancy positively and significantly affected the academic achievement of participants.

Additionally, the present research contrasts with the findings reported by Fakharian et al. (2019). Their study sought to establish whether academic buoyancy and the classroom environment significantly predicted students' academic engagement. The significance of students' academic buoyancy and classroom environment on academic engagement was analysed to address high dropout rates. The study indicated that academic buoyancy was predicted to be associated with improved academic engagement, as vitality is one of the crucial factors in education that students identify as a strategy for dealing with problems and challenges. Conversely, poor classroom environments were identified as academic challenges, barriers, and pressures that can make students tired and frustrated at school. However, the results indicated that academic engagement has no direct effect on academic buoyancy and the classroom environment.

Interestingly, from the predictive equation combining the three classroom climates, the interactive classroom climate had the highest predictive index on Biology achievement. The respectful classroom climate had the second-highest predictive index, while the supportive classroom climate had the least and a negative significant correlation with Biology achievement. This suggests that students' academic buoyancy was high and indicates that Biology achievement is greatly influenced by this variable. It also suggests that students' classroom

climate varies across different schools; however, the interactive classroom climate is the greatest predictor of Biology achievement.

Furthermore, the outcomes indicate that irrespective of gender, school category, or age of students, classroom climate and academic buoyancy significantly affect Biology achievement scores. Therefore, low Biology achievement in Juja Sub-County may be associated with a poor classroom climate and low academic buoyancy among the students. The low classroom climate scores, as well as the low academic buoyancy, may be impediments to achieving higher academic performance in Biology.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

Brief explanation of the research outcomes is provided, followed by conclusions and recommendations focusing on the goals of the study.

5.2 Summary of the Findings

The research aimed to establish the relationship between classroom climate and students' Biology achievement, to assess the correlation between academic buoyancy and students' Biology achievement, to investigate gender variations in classroom climate and academic buoyancy, and to predict the interrelationship between classroom climate and academic buoyancy on students' Biology achievement.

Relationship Between Classroom Climate and Biology Achievement

This research established a negative and significant relationship between classroom climate and biology achievement. Male students had the highest classroom climate scores, influenced by respect, support, and interaction, and their Biology achievement was better than that of female students. Co-educational institutions generally had a better classroom climate on average compared to boys' and girls' boarding schools. Analysis of classroom climate levels showed that supportive classroom climate was preferred most, followed by interactive and respectful climates. However, interactive classroom climate was the most significant predictor of achievement in Biology, followed by supportive and respectful climates. Pearson's correlation

revealed $p<.05$, implying a significant relationship between classroom climate and Biology achievement.

Relationship Between Academic Buoyancy and Biology Achievement

On the correlation between academic buoyancy and Biology achievement, the findings suggested that there is no substantial correlation between the two. However, male participants generally demonstrated higher academic buoyancy compared to their female counterparts. The statistics also indicated that academic buoyancy varied across different types of schools, with boys' boarding schools showing the highest academic buoyancy scores and girls' boarding schools showing the lowest. Co-educational institutions had moderate academic buoyancy scores. Despite most respondents having high academic buoyancy, the results revealed that academic buoyancy did not significantly affect Biology achievement.

Gender Differences in Classroom Climate and Academic Buoyancy on Biology Achievement

Regarding gender variations in classroom climate and academic buoyancy and their effects on Biology achievement, the multiple regression equations reveal that both classroom climate and academic buoyancy predict Biology achievement and vary between female and male students. Specifically, the results showed that academic buoyancy had the highest predictive index for Biology achievement among male students, while classroom climate had the highest predictive index for female students. Furthermore, most female respondents had a higher score in classroom climate compared to their academic buoyancy, suggesting that female students place greater importance on having a favourable classroom climate than on academic buoyancy. In contrast,

male respondents had a higher academic buoyancy score compared to their classroom climate score.

Despite the study on gender variations in classroom climate and academic buoyancy in Biology achievement violating the assumption of independent errors, it is evident that male students achieved higher scores in Biology. They displayed a lower classroom climate characterised by respect, support, and interaction, while exhibiting greater academic buoyancy compared to their female counterparts.

Predictive Weight Between Classroom Climate, Academic Buoyancy and Biology Achievement

Finally, on the predictive relationship between classroom climate, academic buoyancy, and Biology achievement, the multiple regression analysis revealed that academic buoyancy, supportive classroom climate, interactive classroom climate, and respectful classroom climate consistently predicted Biology achievement. The findings indicated that all these factors significantly affected a student's Biology achievement. Specifically, academic buoyancy had the highest predictive index for Biology achievement, while among the various aspects of classroom climate, interactive classroom climate had the strongest predictive index. Students who experienced a positive classroom climate and high academic buoyancy achieved better scores in Biology.

5.3 Conclusion

The study outcomes indicate that both classroom climate and academic buoyancy predicted Biology achievement. Notably, academic buoyancy had the strongest predictive index, while classroom climate had the weakest predictive value. It is concluded that high academic buoyancy and a supportive classroom climate could lead to improved Biology achievement. Additionally,

interactive classroom climate was found to have the highest predictive index for Biology achievement, whereas respectful and supportive climates had the lowest predictive indices. Further, it can be concluded that interactive classroom climate and high academic buoyancy are the best predictors of Biology achievement among the various levels of classroom climate.

5.4 Recommendations

The following recommendations are derived from the research outcomes and crucially targets education related policies, and further research in this field.

5.4.1 Policy Recommendations

i. As per objective one, having established that Biology achievement is predicted to a large extent by classroom climate, teachers should ensure and uphold high classroom climate through creating an interactive environment.

ii. From objective two, curriculum developers in Kenya (KICD), teacher trainers and the Ministry of Education should consider inculcating buoyancy skills to teachers. These skills will enable teachers teach students how to maintain high academic buoyancy.

iii. As per objective three, having identified that there are gender variations in achievement emanating from the differences in classroom climate and academic buoyancy. Proper emphasis should be laid down by parents and tutors to assure male students develop better classroom climate and female students maintain high academic buoyancy. Training on the skills is necessary among students to promote high academic buoyancy and interactive classroom climate.

iv. From objective four, teachers and parents/guardians should always encourage students to portray high academic buoyancy and upheld proper classroom climate in learning Biology. Awareness should be created to enable students combine high academic

buoyancy with interactive, supportive and respectful classroom climates to consistently achieve highly in Biology subject.

5.4.2 Recommendations for Further Research

i. Further study need be carried out in counties outside Kiambu County to enable comparison of results. A larger sample size, different sampling techniques such as stratified sampling, and varied research designs such as mixed-method approaches, case studies, and ex-post facto studies could be employed to not only compare and contrast results but also enrich the findings of this study

ii. The study was based on predicting the correlation between classroom climate and academic buoyancy in Biology achievement among Form Three students. Further research should be carried, on the correlation between classroom environment and academic buoyancy in general academic buoyancy among junior school or university students to compare the results across various developmental stages.

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APPENDICES

Appendix I: Consent Form

Kenyatta University

P.O Box 14300-00100

Nairobi.

To whom it may concern,

Dear participant,

My name is Millicent Nyaboke Swanya, I am a Kenyatta University student undertaking a Master of Education degree in Educational Psychology. I am undertaking academic research on classroom climate and academic buoyancy as predictors of academic achievement in biology among form three students in Kiambu County, Kenya. The information obtained will be useful in different sectors towards improving Biology achievement in schools.

The participation in this research is entirely voluntarily and you are also free to ask any question related to the study at any time during the interview. You may also decline to respond or answer any question that you feel it is offensive to you and you are also free to withdraw from the interview at any time you wish.

In case any of the question is offensive or make you feel uncomfortable, please feel free to decline giving out a response. You may also stop the interview at any time. The interview will take approximately 1 hour. The participation in this study is voluntary and no incentives will be given.

The interview will be conducted at the place you feel convenient within the school. The information collected will be only used in this study and your name will not be recorded on the questionnaires.

I agree to participate in the study.

Parent/Teacher Signature……. Date…….

Appendix II: Students Classroom Climate Scale

Part 1: Demographic Information

Kindly tick the most appropriate information about you

Gender; Male……. Female……

School Type; Boys Boarding……. Girls Boarding……

Mixed Day……... Mixed Boarding……...

Age……

Part 2: Student Classroom Climate Scale

The purpose of this questionnaire is to find out your opinions about the class you are currently attending. The questionnaire assesses your opinion about what this class is actually like. Indicate your opinion about each statement by ticking (√) appropriately in the table:

S A if you **STRONGLY AGREE** that it describes what this class is actually like.

A if you **AGREE** that it describes what this class is actually like.

UD if you are **UNDECIDED** in your response.

D if you **DISAGREE** that it describes what this class is actually like.

S D if you **STRONGLY DISAGREE** that it describes

Statement	SA	A	UD	D	SD
The students look forward to coming to classes.					
Students have knowledge of what has to be carried in our class.					
New ideas are rarely tested out in our classroom					
All learners in the class are believed to do the same task using the same methods and within the same timeframe.					
The teacher talks individually with students.					
Learners are diligent in their classwork.					
All learners know their classmates by their first names.					

Learners are displeased with the classroom activities.					
Completing a specific workload is important in this class.					
Novel and variant means of teaching are rarely tried in our classroom.					
Students are often permitted to work at their own paces.					
The instructor goes out of his/her way to assist learners.					
Learners 'clock watch' in the class.					
Students' Friendships is practiced in our classroom.					
Learners have a sense of fulfilment after the class session.					
The group frequently loses focus and deviates from the main point.					
The instructor devises creative activities for students carried out.					
Students decides how class time is utilised.					
The instructor assists every learner who is having difficulty with the work.					
Class pays attention to what other students are communicating.					
The class does not have much time to get to know each other.					
Students have a view that classes are a waste of time.					
The class is disorganised.					

Approaches applied in teaching are variant, innovation and creative.					
The class is permitted to select class activities and how to work them.					
The instructor seldom walk around the classroom to interact with learners.					
The class rarely present their assignments to the whole class.					
Knowing everybody by his/her first name in this classroom takes long time.					
Classes are boring.					
Students' practice exercises are often clear, so that everyone understands how to work them.					
Classroom seating arrangements is the same way every week.					
Teaching methodologies allow the learners to work at their own pace.					
The teachers are not interested in students' predicaments.					
The class is presented with an opportunity to convey opinions in this class.					
The class members get to acquit to each in class.					
All students love coming to the classroom.					
The class rarely starts in time.					
Unusual class activities are often thought by the teacher.					
There is little opportunity for the class to pursue their specific interest during class time.					
The instructor is unapproachable and lack consideration toward learners.					
The instructor leads most of the class discussions.					
Learners in this class show little interest in getting to know their peers.					
Classes are interesting.					

Classroom activities are precisely and keenly orchestrated.					
The class seems to participate in similar activities every class session.					
What to be performed in our class is decide by the teacher.					

Scoring the Classroom Climate Inventory

Use the worksheet below to record items averages in each of the instrument's three categories.

Supportive – emphasises opportunities for students to interact with the instructor and the instructor's concern for student's personal welfare.

Item 1
Item 4
Item 8
Item 15
Item 11
Item 18
Item 22
Item 25
Item 29
Item 32
Item 35
Item 39
Item 42
Item 46
Item 49

Interactive - assesses extent to which students participate actively and attentively in class discussions and activities with teachers.

Item 2
Item 5
Item 6
Item 9
Item 12
Item 13
Item 16
Item 19
Item 20
Item 23
Item 26
Item 27
Item 30
Item 33

Item 34
Item 37
Item 40
Item 41
Item 44
Item 47
Item 48

Respectful - looks at the extent to which students know, help and are friendly toward each other. Also, asks to what extent students are allowed to make decisions and are treated differentially according to ability, interest and rate of working.

Item 3
Item 7
Item 10
Item 14
Item 17
Item 21
Item 28
Item 24
Item 31
Item 35
Item 38
Item 42
Item 45 and 49

Appendix III: Academic Buoyancy Scale

Tick (√) on any of the following options as the statement applies to you on how you feel test.

Key: 1 – Strongly disagree (SD) 2- Disagree (D) 3 – Undecided (U) 4 - Agree (A) 5 - Strongly agree (SA)

	SD	D	U	A	SA
I don't let stress overwhelm me.					
I am good in dealing with schoolwork pressures					
A poor mark does not have an impact on my confidence					
I handle setbacks, like receiving negative feedback on my work, effectively.					
I feel embarrassed when I get poor results in a biology test.					
I doubt my chances of succeeding in Biology tests					
I would try to think of new solutions					
I would use my past successes to help motivate myself.					
I would set my own goals for achievements.					
I would see any situation as a challenge					
I would do my best to stop thinking negative thoughts					

I would not accept my teacher's feedback					
I would use the teacher's feedback to improve my exam achievement in Biology					
I would keep trying					
I would prevent myself from freaking out					
I would explore various ways for learning Biology.					

Appendix IV: Yamane Formula

The Yamane formula that will be used to come up with the sample size is as below;

$$n = \frac{\mathrm{N}}{1 + \mathrm{N}(e^2)}$$

Formula key,

n= sample size,

N = is the population size,

e = is the level of precision,

Since the population proportion is definite, N = 4,000 and e = 0.05. Therefore, the sample size will be approximated 399 students.

Appendix V: Cronbach's Alpha formula

$$\alpha = \frac{\text{J}\text{N}.\acute{\text{C}}}{\tilde{\text{V}} + (\text{J}\text{N} - 1).\acute{\text{C}}}$$

Where; α = the number of items,

JN = the covariance between item-pairs,

$\tilde{\text{V}}$ = the average variance.

Cronbach's Alpha is consistent in telling the close correlation between a set of test items.

Appendix VI: Map of Kiambu

APPENDIX VI: Research Permit

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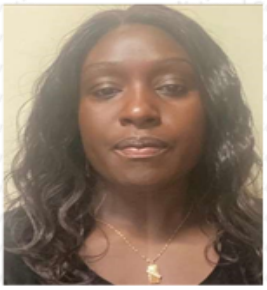

This is to Certify that Ms.. Millicent Nyaboke Swanya of Kenyatta University, has been licensed to conduct res provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Kiambu on the topic: Classroom C Academic Buoyancy as Predictors of Academic Achievement in Biology among Form Three Students in Kiambu for the period ending : 02/February/2025.

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