

**FACTORS INFLUENCING STUDENTS' KCSE ACADEMIC PERFORMANCE IN  
CHEMISTRY IN PUBLIC SECONDARY SCHOOLS IN MUKAA SUB-COUNTY,  
MAKUENI COUNTY**

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**A Research Project Submitted to The School of Education and Social Sciences in Partial  
Fulfilment for The Conferment of the Award of Masters in Education in Educational  
Administration, Lukenya University.**

**October,2024.**

## DECLARATION

This project is my original work and has not been presented for any award in any other University.

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## **ABSTRACT**

Chemistry plays a critical role in development of thinking skills, creative problem solving, precise communication as well as teamwork skills for 21<sup>st</sup> century socioeconomic

development. Despite Chemistry playing an important societal role, students continue to perform poorly in Chemistry in national examinations. In Mukaa Sub-County of Kenya, very few students attained the required grade of C+ in Chemistry. The study's main aim therefore was to assess factors influencing Chemistry performance in KCSE among learners in public secondary schools in Mukaa Sub-County. The study assessed how: Student's attitude, teacher motivation, teaching and learning resources influence Chemistry performance in KCSE among learners in public secondary schools in Mukaa Sub-County. The study was founded on social cognitive theory, self- efficacy theory as well as Plato and Socrates' perspectives on teaching and learning. It targeted School headteachers, Chemistry teachers and Form Four students from all the public secondary schools in Mukaa Sub-county. Slovins formula was used to come up with a sample of 12 secondary schools out of the 42 public schools in Mukaa sub county. From each of the schools, purposive sampling was used to select head teachers, Chemistry teachers and students. The study therefore had a sample of 156 respondents comprising 12 head teachers, 24 teachers of Chemistry, and 120 form four students who take Chemistry in those schools. Students were selected among the students in the previous end-of-term examinations. Questionnaires were used to collect data. SPSS were used to aid in data analysis. Descriptive statistics comprising frequencies, percentages, mean and standard deviation were used to organize findings. Chi-square tests were used to establish relationships. Tables were used to present the study findings. The study found that students generally had negative attitudes towards chemistry subject terming it as a complex subject. Majority of students were from poor backgrounds and therefore lacked necessary resources for learning Chemistry. Teaching resources were also found to be inadequate. The findings showed that poor preparedness of teachers in Chemistry was brought about by heavy workload. Chi-square analysis showed that students attitude ( $p=0.000$ ) and teaching resources ( $p=0.021$ ) were significant at 95% confidence level. Cramer's V values showed that student's attitude ( $v=0.680$ ) had a greater influence than teaching resources ( $v=0.305$ ). The study therefore concluded that poor Chemistry performance in KCSE among learners in secondary schools in Mukaa sub-county could have been caused by students' negative attitudes and inadequate teaching resources. It was recommended that secondary schools in Mukaa sub-county to hire motivational speakers in order to change their poor perception of Chemistry. In addition, the ministry of education should commit more Chemistry teaching resources to secondary schools. Benchmarking with schools performing well in Chemistry should also be done where students can visit and learn. The study also recommended that teachers use audio-visual equipment and internet-based programs to teach Chemistry.

## **DEDICATION**

This work is dedicated to my dear parents Mr. & Mrs. John Muinde, my husband Stephen Kauso and my children Fredrick Kauso and Estefanny Mwende.

## **ACKNOWLEDGEMENT**

First and foremost, my gratitude goes to the Almighty God for giving me the grace to endure all the challenges faced during my study period. I wish to thank Lukenya University for their kind consideration in giving me a chance to pursue my studies in this institution.

I wish to extend my gratitude to my supervisors Dr. Winfred Kaleli and Dr. Charles Mwambela, my very supportive supervisors, for their immense support, encouragement, insights and their cumulative efforts in guiding and giving directions throughout the writing of this project. Dr. Judith Wafula who introduced me to the project writing and for her quick response any time I lost direction

I acknowledge the support of Dr. Muniko Marwa, Dr. Ali Khamah, Dr. Domitila and Prof. Imteyaz for their kindness and efforts in giving guidance and corrections during our concept and proposal presentations. I owe gratitude to all lecturers for their positive criticism and corrections during presentations, that has brought my project into completion and any other person who, in one way or the other, contributed to my success. God bless you all.

I also wish to thank my colleagues for their encouragement and continued support throughout my study period.

Special thanks go to my family for their understanding, patience and support during my busy schedules.

God is awesome.

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## **LIST OF ABBREVIATIONS**

<b>BA:</b>	Bachelor of Arts
<b>BSC:</b>	Bachelor of Science
<b>KCSE:</b>	Kenya Certificate of Secondary Education
<b>KESI:</b>	Kenya Institute of Special Education
<b>PGDE:</b>	Postgraduate Diploma in Education
<b>SMASSE:</b>	Strengthening of Chemistry and Sciences in Education
<b>S/NO:</b>	School Number

## **DEFINITION OF KEY TERMS**

**Effect:** Having a benefit or contribution to something.

**Students Engagement:** Refers to the degree of attention, curiosity, interest optimism from the learner when they are learning or being taught.

**Attitude:** Refers to students' feelings or opinions towards engagement in Chemistry learning.

**Performance:** In the study, it refers to the outcome of learner's results in KCSE examination that is measured in terms of their grades and mean scores.

**Independent variables:** They are variables that stand alone and are not changed by other variables that the researcher is trying to measure. E.g., Student's attitude.

**Dependent variables:** It is the variable that depend on the factor that is being measured.

**Intervening variable:** It is a variable that handles the change in the dependent variable due to the change in the independent variable.

# CHAPTER ONE INTRODUCTION

## 1.1 Background of the study

Chemistry is one of the science subjects that play a significant role in society. It prepares students for the real world of work through carrier opportunities such as chemical engineering, medicine, pharmacy, food science, and environmental studies (Mahdi, 2019). These provide job opportunities in numerous sectors of the economy, namely in petroleum industries, Metallurgy, ceramics, glass, plastics, cement, pharmaceuticals, food, and drinks, fertilizers, transportation, educational industries, etc. Since Chemistry is one of the examinable science subjects offered in secondary school levels in Kenya, it plays a key role in shaping how individuals deal with various spheres of private, social and civil life (Anthony & Walshaw,2020). Over the years, several studies investigated the learning achievement in chemistry at senior secondary school levels. The findings from these studies displayed the low performance of students in some essential topics, particularly the understanding of the concepts such as the writing of chemical formulae and equations and undertaking calculations from them, concepts of equilibrium of chemical reaction, and mole concepts, among others (Kendura, & cherry, (2021)).

The chemistry was taken as an intricate and complicated subject leading the students to develop a negative attitude in some concepts such as electrolysis, redox reaction, acid and bases, state of matter, and organic compounds (Dianne Kathryn Kelly (2021). However, chemistry is of great importance to recognize the problematic areas and some misconceptions that students may encounter within chemistry concepts and propose the strategies to be adopted to address them. Some authors revealed that the low performance in chemistry is attributed to the negative attitude towards learning and teaching chemistry and ineffective instructional techniques and teaching aids (Cheung, 2019), who conducted the study in Hong Kong and the students interviewed claimed that they do not like chemistry. This was attributed to the traditional teaching methods based on chalk and talk commonly used by the teachers while solving simple problems on the boards. They mentioned that their teachers prepare them only for public examination, where they are provided materials to memorize everything. Only

a few chances are given to them to conduct experiments in the laboratory. Since most teachers rely on rote-learning in chemistry classrooms, students get bored and start developing a negative attitude towards the subject.

The Government of Kenya thus acknowledges the importance of improving Sciences in achieving Millennium Development Goals and in the attainment of the Vision 2030 as would provide the necessary manpower to steer the country into new technological and industrial development. This is evidenced by the concerted effort by the Government through the Ministry of Education to improve the performance in secondary science (Chemistry included) through the implementation of CEMASTEIA project and STEM. However, the low performance in the subject has persisted despite the desperate attempts to provide enough teachers, facilities and in-service training for teachers and provision of other necessary materials posing a lot of concerns to all stakeholders in Education. This implies that there are other factors at play that need to be further investigated. An analysis of performance in K.C.S.E results below reveals that Chemistry is among the poorly performed subject which is also the case in most schools in the country. Bearing in mind the importance attached to the subject, the continued under achievement would lead to ripple effects which would undermine the future development of the country. It limits the learner's choice on career opportunities and also makes learning and mastering of other subject across the curricular difficult, otherwise the well-set objectives of the subject can hardly be achieved due to underachievement in the subject. While most reform efforts seem to embrace the importance of proper learning objectives and instructional methods, they fail to realize the full impact of teacher motivation, teaching methods, students' attitudes can have on the subject learning and achievement.

## The KCSE Chemistry Performance of 2022

**Table 1.1: Mukaa Sub-County 2022 KCSE Results Chemistry (Ministry of Education)**

S / N	School Name	Entry	B	G	M/S 2022	M/S 2021	M/S 2020	Dev
	Mukaa G	108	0	108	4.390	3.552	3.635	0.838
	Mukaa B	393	393	0	4.292	3.357	4.000	0.935
	Nduluni	166	79	87	4.024	4.438	3.684	-0.414
	Kiongwani Boys	166	166	0	3.608	2.607	3.065	1.001
	A.B.C Kitonguni	84	41	43	3.357	2.200	2.244	1.157
	Kiongwani G	124	0	124	3.113	2.548	3.167	0.565
	Kasikeu Boys	109	109	0	2.862	2.570	3.088	0.292
	Masokani	55	14	41	2.618	2.081	2.696	0.537
	Kitaingo	47	47	0	2.596	2.096	3.094	0.500
	Kasikeu Girls	65	0	65	2.523	2.413	3.094	0.110
	Lumu	48	22	26	2.500	1.837	2.171	0.663
	<b>Mean Score</b>				2.465	2.122	2.480	0.343

**Source: Ministry of Education (2023)**

Furthermore, a comparison with the other subjects in 2013 and 2014 ranks it as number 14 and 13 respectively. It is the worst performed science in the Sub County.

Tabular and graphical representation is as below.

### Subject Mean Scores

**Table 1. 2 K.C.S.E Analysis 2018- 2022 (Mean %)**

<b>Subject</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>
<b>English</b>	39.3	38.9	40.8	37.9	27.5
<b>Kiswahili</b>	38.6	43.6	40.1	35.8	41.6
<b>Maths</b>	21.1	23.1	22.0	28.7	27.6
<b>Biology</b>	27.2	29.2	28.3	26.2	31.6
<b>Chemistry</b>	19.1	24.9	19.9	27.9	24.8
<b>Physics</b>	31.3	35.2	32.6	37.9	40.1
<b>History</b>	45.9	45.8	47.7	40.9	44.7
<b>Geography</b>	38.9	37.5	40.5	46.6	42.4
<b>CRE</b>	42.2	46.1	44.5	44.0	48.0
<b>Agriculture</b>	38.8	34.0	40.4	35.0	33.6
<b>Business Studies</b>	51.9	54.8	54.0	56.9	57.0

*Source: - Ministry of Education, 2023*

## **1.2 Statement of the problem**

In comparison with other subjects, Chemistry takes the bottom positions of 13 out of 15 subjects and 14 out of 16 subjects in 2018 and 2022 respectively. Performance in Chemistry has been dismal from 2018 to 2022. The performance, though was not good at first continues to deteriorate and this is worrying. Sub average performance in Chemistry affects the Mukaa Sub County's ability to admit students in universities in courses to do with science and technology. In the county, most of the students take Chemistry and therefore poor performance in the subject affects their social mobility. This is despite the fact that the government has put in measures to

improve performance in the subject through launching the Strengthening of Chemistry and Science in Secondary Education

(SMASSE)- project, in 1998 that aimed at improving Chemistry and science education through In- Service Training (INSET) for teachers. Factors that could lead to this poor performance are; Instructional resources, Teaching method, Teacher's motivation and Learner's attitude. The study therefore, investigated the factors that contribute to poor performance in Chemistry in public secondary schools in Mukaa Sub-County, Makueni County, with the aim of suggesting strategies for improvement in the learning and performance of Chemistry.

### **1.3 Purpose of the study**

The purpose of the study was to investigate the factors influencing Chemistry performance in K.C.S.E in public secondary schools in Mukaa Sub-County, Makueni County

### **1.4 Research objectives**

The study will be guided by the following objectives:

- a) To assess the attitude of students towards Chemistry performance in K.C.S.E in Public Secondary schools in Mukaa Sub-County, Makueni County
- b) How does teachers' preparedness influence Chemistry performance in KCSE among learners in public secondary schools in Mukaa Sub-County, Makueni County

- c) To determine how teaching and learning resources influence Chemistry performance in KCSE among learners in public secondary schools in Mukaa Sub-County, Makueni County
- d) In what ways does teacher motivation influence Chemistry performance in K.C.S.E in Public Secondary schools in Mukaa Sub-County, Makueni County

### **1.5 Research questions**

In order to achieve the objectives of the study, the following questions were addressed:

- a) What is the attitude of students towards Chemistry performance in K.C.S.E in Public Secondary schools in Mukaa Sub-County, Makueni County?
- b) What are the influences of teachers' preparedness and workload on Chemistry performance in KCSE among learners in public secondary schools in Mukaa Sub-County, Makueni County?
- c) To what extent does teaching and learning resources influence Chemistry performance in KCSE among learners in public secondary schools in Mukaa Sub-County, Makueni County?
- d) How does teacher motivation influence Chemistry performance in K.C.S.E in Public Secondary schools in Mukaa Sub-County, Makueni County?

## **1.6 Significance of the study**

The findings of the study may be of benefit to different stakeholders in education. Learners may be able to know the correct attitude they ought to have in order to pass in the subjects. School chemistry teachers will be able to adjust their teaching methodologies appropriately for maximum results as they are the curriculum implementers.

Chemistry teacher trainers in various universities and colleges may be able to know the major areas of emphasize on efficient teaching methodologies. School administrators may use recommendations to provide a conducive system for the high performance in Chemistry.

## **1.7 Limitations of the study**

The study was carried out in Makueni County and specifically in Mukaa sub- County. The region has quite a number of both public and private secondary schools and the sample size may not have been a full representative of the entire school population in the area. The research findings might have been affected by climatic changes of the environment to the respondents. The questionnaires used or distributed were not fully collected while others were collected with some sections not answered. Learners gave varied views, which were a bit complex to harmonize as were not consistent in some sections.

### **1.8 Delimitations of the study**

The study was based on secondary schools in Makueni County where the subject ranking composed of both very poor and good performances. The study would confine itself to form four students who were just about to sit for their final exams as they already have established predispositions towards the subject and where majority of them coming from the same social and economic background. The schools selected had considerably adequate subject teachers, facilities and conducive environment, which could allow for the research investigation factoring out other factors affecting performance in the subject. Several researchers reveal a variety of factors known to influence learning and achievement in the subject ranging from economic, cultural, social, but this study focused on student factors and specifically on students' attitudes concerning the subject as this has never attracted enough attention from all stakeholders in education sector.

### **1.9 Basic assumptions of the study**

This study assumed the following; There was no gender difference in attitudes towards the subject, Negative attitudes prevented the learners from realizing their success in the subject ,All schools sampled had the adequate facilities, infrastructure and staff, Learners targeted knew where they range in terms of performance in the subject, The respondents would co-operate and provide genuine information during data collection and that the findings of the study would be used to generalize all schools in the county.

### 1.10 Definition of significant terms used in the study

**Challenges:** Refers to problems or difficulties encountered in the process of implementing chemistry syllabus which could negatively impact on quality of performance in the subject.

**Chemistry:** Is a branch of science that deals with study of nature and properties of all forms of matter and the various changes that these substances undergo in different conditions.

**Head teacher:** Refers to the administrator of a school appointed by the Teachers Service Commission in accordance with Education Act Cap 211.

**Performance** Refers to student's achievement in Chemistry as indicated by their scores in an important school or national examination.

**School Facilities-** school facilities means school plant facilities, school plant projects, school buildings and the grounds

**Science:** Is a vast body of connected knowledge of theories and facts developed by scientists through scientific methods.

**Students' attitudes-** refer to students' predisposition or a tendency to respond Positively or negatively towards education.

### **1.11 Organization of the study**

This study is organized into five chapters. Chapter One focuses on the background of the study, statement of the problem, purpose of the study, objectives of the study, research questions, significance of the study, basic assumptions of the study, limitations of the study, delimitations of the study, definition of significant terms used in the study and the organization of the study. Chapter Two deals with literature review with a focus on the major reasons why students do not perform well in Chemistry which include attitude of the learner, motivation of the teacher, availability of instructional resources and teacher characteristics. Chapter Three presents the research methodology. This describes the design of the study, location of study, research instruments, sample size and sampling procedures, data collection and data analysis. Chapter four describes the data presentation, analysis and interpretation. While chapter five discuss the summary of the findings, conclusion and study recommendations.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

In chapter two, related literature reviewed was to address the knowledge gap. Theoretical literature and empirical literature was premised on factors influencing Chemistry performance in KCSE among learners guided by the study. The purpose of literature review was to discover inconstancy, areas to explore in research, incompatible in preceding surveys and previously not answered or left open questions. According to the Chemistry syllabus the study of chemistry in secondary schools in Kenya is geared towards helping students to: acquire chemical knowledge in order for them to understand their physical environment, be aware of Chemistry Knowledge, to foster acquisition of problem-solving skills, appreciate the responsibility of a chemist to the society and prepare them for further training in Chemistry related areas (KNEC, 2019). Learning is a relatively permanent change in behaviour potentiality which occurs because of reinforced practice (Kimble & Marguis, 2019). Learning Chemistry like other disciplines utilises different methods of instructions like lecture methods, question answering techniques, trip or field work, teacher demonstration and student practical work (Twoli, 2020), in order to cause change in performance in Chemistry. A study on the factors contributing poor performance in Mukaa Sub County will enable discovery of factors that hinder learning of the subject in the Sub county

## **2.2 Factors affecting the performance of Chemistry**

Factors that affect the performance of Chemistry are as follows:

### **2.2.1 Influence of Student's attitude on Performance in Chemistry**

Attitudes are psychological orientations developed as a result of ones' experiences which influences a person's view of situations, objects, and people and how to respond to them either positively or negatively or favorably or unfavorably (Mensah et al, 2019). Attitude is an organization of feelings and behavioral tendencies towards an object (Vaughan& Hogg, 2019). Attitudes are positive or negative views about a person, object, idea or situation which influences individual choice of action and responses to challenges (Kendura, & cherry, (2021).

Attitudes have three interrelated qualities or components which vary in direction and degree or strength. This includes the; Emotional components- how we feel; A cognitive component-thoughts.A behavioral components - action, experiences (Dianne Kathryn Kelly (2021). The social learning theories by Bandura postulate that individuals acquire attitudes through observing imitating and modeling the behaviors of others. They therefore, form through direct experience with models, object or issues or ideas we interact with. They are learnt attributes which affect our behavior.

Research has it that people behave in accordance with their attitudes under the conditions that; the attitudes are as a result of personal experience; that one is expecting a favorable outcome or where the model is attractive, popular or successful (Bandura & Zimmerman, 2019). A student can develop positive attitude towards chemistry because he or she learns to associate positive experiences or events with it. Also, positive reinforcement creates room for the formation of positive attitude for chemistry (Mensah et al, 2022).

Attitude towards Chemistry presents a disposition towards an aspect of Chemistry that has been acquired by an individual through his or her experiences but which could be changed (Eshun, 2019). Some authorities regard attitude towards Chemistry as just a like or dislike for Chemistry, while others extend the meaning to embrace ability and usefulness of Chemistry. For Papanastau (2020), attitude towards Chemistry is just a positive or negative emotional disposition towards Chemistry.

Considering attitude towards Chemistry from multidimensional perspectives, it interprets students' attitude towards Chemistry as a more complex scenario characterized by the emotions that one associates with it. One's attitude about Chemistry and how one behaves towards Chemistry (Hart, 2019). This attitude if negative is reflected by the fact that students may shy away and would always try to avoid Chemistry tasks. A positive attitude towards the subject is an important educational outcome that should be nurtured regardless of the achievement level of the learners who should be helped in order to bring out their best abilities.

They influence our social thought and help us to organize and evaluate stimuli into pleasant or unpleasant or negative or positive or useful or not useful. Attitudes have a strong effect on behavior which helps in understanding and predicting people's' behavior in a wide range of contexts. Attitudes though not directly observable are inferred from observable responses and beliefs. They are elicited by certain stimuli and gradually get established into a consistency or a tendency.

Positive attitude towards a subject was related positively to performance. In Kenya, research done by Nui and Wahome, (2020) in secondary education, has showed that consistent failure in sciences might be attributed to both the teachers and students attitudes towards the subjects. In agreement to this Manoah, Indoshi and Othuon (2021) observed that attitudes played an

essential role in the performance of students'. Students with positive attitude tended to perform well in an exam. Considering these studies, the role of attitude could be a key factor in determining how well a curriculum is implemented in learning institutions and in particular Chemistry subject.

The different but interrelated variables were also used to find an insight on the characteristics that define attitude in the environment of the school. In general, the student's attitude was found to be positive in relation to Chemistry. The study also focused on the relationship between final academic results and the score in Chemistry in relation to attitude. Gender was not a factor identified by the study though a continuous negative trend was observed in girls in relation to their attitude as they progressed in school. Variables related to motivation when subjected to hierarchy analysis using structural equation modeling were shown to be the principal attitude predictor in Chemistry. In Opolot-Okurut (2019) study, the attitude of students in secondary schools in relation to Chemistry is interrogated. The results indicated substantial variation in the variables measuring attitude investigated on both female and male students. The attitude of students in schools performing highly showed an attitude that was positive compared to that of students in schools performing lowly.

Peppin (2021) compared the attitude of students in England and Norway. The study found their attitude to be influenced by their social and cultural design. This molded the environment and framework in which Chemistry was learned. The study noted both similarities and differences that emanated from the influence of the environment. Though the statistical survey was premised on compact sample, attitude on Chemistry was observed to be positive in year 7/8. The students in both countries showed similar results. The positive attitude among the students declined in year 9 then it increased in year 10/11. The analysis of the qualitative data

from the student's comments concerning their attitude pointed out seven factors that seemed influential. The factors were slightly common but the understanding different based and a link was drawn to the learning surrounding Chemistry in the classroom.

Another key factor likely to affect student attitude towards Chemistry is self-efficacy. This refers the student's personal ability and confidence in grasping new abilities and assignments usually within the academic territory (Nasiriyani, Azar, Noruzy & Dalvand, 2021). Self-efficacy by students is a vital factor of motivation that assists in anticipating the student's preferred actions, attempts and academic achievements (Pintrich & Schunk, 2022). Multon, Brown and Lent (2021) subjected academic self-efficacy to meta-analysis. A variance of 14% was reported on the beliefs of self-efficacy on the pedagogical accomplishments of learners while a variance of 12% was reported on the persistence of the learners pedagogy. Britney and Pajares (2019) conducted a survey targeting learners in middle school and their performance in the subject of science in connection to effectiveness. The study sampled grade 5 – 8 students and established that the student's grades in the science subjects were constantly influenced by self-efficacy. A multi-purpose research was conducted by Khan (2021) on a small scale. The study's initial purpose was to ascertain the difference between the perspective of learners towards Chemistry within government and privately sponsored secondary schools in Quetta, Pakistan. The survey also aimed at establishing if student's perspective regarding Chemistry was affected by differences in gender. The findings of the study did not yield any significant distinctness between the students' attitude in both the public and private secondary school in relation to Chemistry. Scrutiny of the subscale level results shows no difference that can be significantly considered other than the value of Chemistry. This was evident in both the private and public schools. In addition, the study revealed significant attitude differences

between the genders. A significantly high degree of positive attitude was observed among male students in contrast to the attitude towards Chemistry on the counterparts who are female.

A quantitative study was conducted by Vella (2021) on how the gender difference and age influenced the perspective of learners regarding Chemistry. The study design was conducted at state Junior Lyceum secondary schools. Questionnaires were issued to form 1 and 3 students totaling 160. Questions were based on the Likert scale with 32 statement divided into 4 options. A section at the bottom end of the questionnaire enabled the learners give their opinions on their attitude towards Chemistry. The study took note of the student's annual marks in the questionnaire. Attitude was found to be a significant factor influencing performance. Form 3 males and Form 1 females in the secondary schools were found to have significant statistical scores in attitude. An increase in the age of the students had significance in their pessimistic perspective regarding Chemistry. It was noted in the annual examination that girl's achievement seemed to outperform boy's achievement. Notable statistical variations favoring female learners were recorded within Form 1 in secondary schools and within those in Form 3 learners. The study findings, based on the student's comments, showed that teachers very much influenced the advancement of the student's attitude.

A similar study investigating gender difference and their attitude towards Chemistry was conducted by (Asante 2022). The survey was administered Accra, Ghana. The survey used democratic data questionnaire and attitude towards Chemistry inventory (ATMI) to collect anonymous data from the respondents. SPSS version 16 was used to analyze the data collected and convert them to mean. The study revealed that there existed sufficient attitude difference displayed between the two genders towards Chemistry. The environment of the school,

attitudes of the educators and their beliefs, styles of teaching and attitudes of their parents were identified as determinants of the student's attitude in relation to Chemistry.

An investigation was conducted by (Ajisuksmo & Saputri (2019). It centered on establishing the effects of perspectives of learners in high school in relation to Chemistry and awareness on metacognitive in relation to their achievement in Chemistry. To measure the student's attitude in relation to Chemistry, the Attitudes towards Chemistry Inventory (ATMI) was applied while metacognitive ability was measured using Metacognitive Awareness Inventory (MAI). When conducting the study, the report cards of the school throughout the semester were reviewed so as to measure the achievement in Chemistry.

Aqajani, Khormayi, Rajabi, Rostam and Khiavi (2019) conducted a study in Kazerron city on primary school students. The survey was set to establish if a link existed between self-efficacy and self-confidence in relation to anxiety in Chemistry. The survey established that parameters of self-efficacy and self-confidence positively influenced anxiety in Chemistry. The variable, emotional self-efficacy, learning self-efficacy and self-confidence when analyzed using multivariate regression indicated that student's anxiety in Chemistry was strongly being predicted by these variables. Anxiety in Chemistry is therefore high in female students compared to male students according to this study. According to the findings, anxiety in Chemistry is significantly different from anxiety in other fields of science in humanities. A study was conducted by Nikmanesh and Yari (2019) in Sabzevar on mixed high school students. The study sought to establish the link between anxiety in exams with selfperception and self-efficacy. The survey established that there was a substantial connection between anxiety in exams and self-efficacy. It also established a positive relationship between the 3

parameter (aggressive perception, acting perception & passive perception) of self-perception with anxiety in exams.

### **2.2.3 Influence of Teaching Resources on Performance in Chemistry**

A report by the World Education Forum in Dakar blamed educators for ineffective utilization of resources. The report pointed out that there were no new skills in schools and that they lacked technology that could assist them acquire knowledge (Visser, Andrea & Feza, 2019). This was observed in about one-third of the secondary schools in the world. Additionally, the report argues that in cases of limited resources, there was reduction of the workload making science and Chemistry become less stimulating. Githua, (2021), posits that the poor Chemistry performance was as a result of the teachers not having enough experience in teaching Chemistry, inadequacy of materials and equipment's in teaching Chemistry. Students lack the required knowledge on basic Chemistry techniques and that the simple processes and algorithms were not known by the students (Lashley, 2019). This was a common weakness that was observed from students and led to attaining low Chemistry marks in KCSE. This failure to understand these concepts is a manifestation that other elements such as lack of proper methods of teaching, inadequate resources among others that hinder effective apprehension of the subject of Chemistry in public secondary schools.

In Kenya within Igoji division, Kaume (2019) desired to discern the trends of allocation of resources and the effects on the achievement of learners in sciences and Chemistry. The survey was conducted between 2019 to 2022. The survey included within the division of Igoji, fifty science and Chemistry teachers and 7 head teachers. The study established that schools in which physical resources were highly available performed better than those whose levels of

physical resource availability was low. Students who came from well of families better performed in science and Chemistry. Also, science and Chemistry performance of the students was negatively correlated by the experience of teachers. The study established that schools with a teacher ratio that was low compared to students performed better than those with less teachers per students. Schools that were found to have sufficient resources for learning and teaching performed well compared to schools without sufficient resources.

In 2011, a compound regression investigation was performed on Trends in International Chemistry and Science Study (TIMSS). The data was collected from learners in South Africa to assist find out what influenced their performance in Chemistry. The Chemistry achievement of students was found to be influenced by the environment of their home and school (Viser, Juan & Feza, 2019).

A study in Bondo district in Kenya was performed by Yara and Otieno (2019) to determine the predictors of academic accomplishment of Chemistry learners within secondary schools in relations to tutoring and apprehension using the available resources. The study used stratified sampling and divided them into the following strata: co-educational day, co-educational boarding, boys boarding and girls boarding. The questionnaire for the student's was validated on performance (SPQ). Multiple regression analysis was used to analyze the collected data. The study found eight independent variables to have a positive correlation on performance of Chemistry which was the dependent variable. In total the eight variables amounted to 23.6% of the overall variance in the measure of independence. Financial support from the government, trained teachers, labs/classes and the ratio of books for studies to students could be utilized to anticipate academic accomplishment in Chemistry.

A study was conducted in Tanzania by Yusta, Karugu, Muthee and Tekle (2019) to scrutinize the connection between the performance in Chemistry and instructional materials. The study considered integrated primary schools and targeted learners with dyscalculia within Arusha. The study had two objectives. The first was to find out what instructional resources Chemistry teachers use in integrated schools. The second objective was to examine if Chemistry teachers in integrated schools adequately used instructional materials. Graphic and regalia resources were identified by the study to be frequently used by the teachers. The study observed a lack or inadequacy of the identified types of instructional materials. The five common ones are audio, visual, audio-visual and regalia. A separate study was conducted in South-West Nigeria in relation to how Chemistry performance of pre-university students was being affected by the equipment's utilized in tutoring and knowledge infusion. The study made use of standardized questionnaires that were administered on students to measure their performance. The questions were structured to answer three questions on the learner's Chemistry accomplishment. The acquired data was scrutinized using correlation analysis, multiple regression analysis and coefficient of determination. The independent variable having been subjected to the three methods of analysis established that they had no notable impact in the learner's Chemistry performance.

A comparative study was conducted by Afana and Lietz (2020) on the relationship between the resources provided by the school and the student's achievement. The study targeted PA educated Arab students. The data was subjected to descriptive analysis, simple regression, cross tabulation and hierarchical linear model analyses. The study's objective was to identify the schools different resources in particular the ICT's, other instructional equipment including the schools physical infrastructure. All these were examined in relation to the Grade 8 student's Chemistry achievement. The study targeted Israeli Hebrew schools, Israeli Arab

schools and Palestinian schools. The three group of schools clearly exhibited differences in the resources available in the school.

Despite the findings, the study clearly showed that inadequacy of support, software and hardware for computers were the only one that significantly affected the student's achievement in Chemistry having considered the schools social and financial stability and the background of learners. The findings were however not consistent with Hebrew speaking schools in Israel. The consistency was observed for Arab speaking schools in Israel and PA.

Lyons (2022) argues that factors such as the resources used in teaching, the demands of the curriculum, motivation of the students, teaching skills and the schools physical facilities are what makes learning complex. Students can therefore achieve good performance if basic resources such as TLR are effectively made available to the school. The school needs to equip itself with sufficient teaching and learning apparatus, adequate tutors and auxiliary employees and make available tangible resources. Such facilities include conducive classroom, laboratories for experiments and libraries for enhancing research. A study examined the West African School Certificate Examination and how students performed in relation to instructional resources. The available teaching resources were related to the student's academic achievements. The achievements of the students were found to have been significantly affected by the material resources. This was because the material resources assisted the students to learn basics and the ideas surrounding them therefore discouraging rote-learning. The findings were observed in cases of inadequate TLR and compromised education levels which points to poor achievements in academics, high dropout rates. Bad behaviors, poor motivations by teachers and education goals that were unmet.

#### **2.2.4 Motivation of the teacher and performance of Chemistry**

Motives are those things that provide impetus behind our behavior. They make the organism active and therefore drive behavior (Munavi, 2022). Motives can be divided into two: Primary and secondary. Primary motives satisfy basic needs for example food, water and pain avoidance while secondary motives satisfy secondary needs like prestige. Primary motives have a greater impact than secondary motives.

Motivation is the sole achievement of human resource management practice. It encompasses job satisfaction of an employee and acquisition of highest level of motivation (Jerris, 2019). Teachers just like any other employee need to be motivated, in order for them to put in a lot of effort in order to achieve performance in the subjects they teach. Motivation enables teachers to help them realise their individual needs in line with those of the organization. Indicators of motivation accomplished are engagement, satisfaction, commitment and intention to quit (Nohria & Lee, 2020).

Studies (Nye, Konstantopoulos, & Hedges, 2022; Chetty, Friedman, & Rockoff, 2022) have confirmed that the academic and lifelong success of students is influenced by their teachers. This has gone against continuous effort by researchers to compare teacher's performance with certain characters like their experience, educational background and the attained certification (Wayne & Youngs, 2019). Studies conducted recently by Kane, McCaffrey, Miller and Staiger (2019) and Grossman, Loeb, Cohen and Wyckoff (2019) have found established some attributes of constructive classroom surrounding, such as organizational skills of teachers and association with students.

The issue of poor implementation of Chemistry curriculum in Africa was reviewed by UNESCO (2019). The report blamed the poor implementation to an insufficient number of teachers who are well trained, lack of and underutilization of teaching methods, a lack of adequate teaching equipment's that are relevant, and a dwindling culture of developing Chemistry. The performance in Chemistry has for years now been a subject of outcry in Uganda's national examinations. A study was conducted at the Makerere University to establish elements that affect primary school students from learning Chemistry. The factors considered identified teachers (83%) as the hindering factor in learning Chemistry. The study considered the following factors: weak techniques of imparting knowledge, scarcity of sustained teacher training and advancement, inadequate preparations due to lack of a strong academic background, inadequate inspiration and ability of teachers in Chemistry (Opolot-Okurut, 2020). The analysis of data revealed the effect the experience from service learning had on this category of teachers and the significant effect it had on the teaching instructions. A wealth of knowledge was added to an already existing literature on the preparation of teacher programs in shaping future teachers who are experience, prepared and qualified.

Naibei, Nakhanu and Aurah (2019) conducted a study targeting primary schools and how students were grasping basic concepts and skills as influenced by the preparedness of the Chemistry teachers. The preparedness of the Chemistry teacher was found to be strongly related to the ability of the learner to acquire basic concepts and skills.

The perception of the findings was that through the study, the teacher's lack of preparedness will be highlighted as a factor leading to poor grasping of elementary Chemistry concepts and expertise consequently poor Chemistry achievement. Boyd, Lankford, Loeb and Wyckoff (2020) estimated the consequences as a result of the preparations of teachers based on the value they impart on students in the exam results in disciplines including Chemistry and

English. The study targeting schools in the New York City, revealed a variation in the preparation programs that were being supplied by teachers and their effectiveness. Teachers in their first year benefited from preparation practices. A qualitative research study was conducted by Hine (2019) to explore how teachers completing graduate diploma perceived themselves. The study targeted trainee secondary school Chemistry tutors graduating with a diploma of secondary education. The study specifically examined the teacher's readiness perception as the start teaching Chemistry in secondary schools. The teachers exhibited a difference in the readiness to teach Chemistry in secondary schools.

An investigation by Arends, Winnaar and Mosimege (2019) aimed at the association between the achievements of the students and the exercises chosen by their tutors in the classroom. Data was acquired through the deployment of questionnaires distributed to teachers. This was part of the Trends in International Chemistry and Science Study (TIMSS). The questionnaire contained questions on the practices employed by tutors to be clear in their enlightenment, discussion in the teaching room, response, developmental evaluation, problem solving and meta-knowledge approaches and cooperation. The findings showed that the performance of the learners was positively related to classroom practices selected by the tutors. The survey's other objective was to establish how the performance of the learner was being affected by how Chemistry teachers collaborated. The study observed that collaboration among teachers was not keenly practiced though it was observed that the performance of the students was positively affected when teachers observed lessons of their peers. It was the discovery of the survey that accomplishments of the students in Chemistry were affected by the various practices teachers used in the classroom. The study recommends that these practices needed to be sought and mechanisms for their implementation instituted to support the teachers.

Gimbert, Bol and Wallace (2019) conducted a study to establish how the achievement of students and the instructions they received was being influenced by preparation programs of the teachers, both traditional and alternative. The study targeted urban secondary schools in high need and chose a mixed method comparative design approach. The study set to answer three questions: 1) is the academic accomplishment of Chemistry students affected by the training of the teacher? 2) Are the teachers adhering to set standards by the National Council of Teachers of Chemistry in their teacher preparation? 3) Is the achievement of the students influenced by how frequently their teachers utilizes the standards guiding process and content? The study targeted the district level quarterly assessment and the standardized state test. The findings show a difference that is significantly inclines towards teachers' alternative preparation on the achievement of students and the utilization of instructional approaches that are standard driven. The study recommended that tutors at the level of high school and middle school are needed to viably explore alternative programs for preparing teachers in order to meet the needs of students of public schools. This strategy can be used in the classroom by qualified Chemistry teachers.

Roba (2019) examined the association between the Chemistry accomplishments of students and the preparedness of their teachers in Marsabit County. The survey determined the various elements of preparing teachers such as: perspective, organizing and encounters which increases the learner's achievements in Chemistry. A statistical difference was found by Chesimet, Githua and Ng'eno (2019) concerning the perceived preparedness by teachers as they sought to implement content in Chemistry at the secondary school based on their experience. No statistical difference was however noted by the qualification of teachers and gender. Areas deemed socially advantaged were more likely to implement a Chemistry curriculum of their own and the teachers were better prepared in teaching Chemistry content

that was advanced. Students with a better Chemistry achievement were mostly found in schools that implemented a Chemistry curriculum of their own. Their teachers also covered advanced Chemistry content.

A survey was conducted the sub-county of Likoni by Njenga (2019) who investigated the factors relating to the teachers' influence on Chemistry accomplishments of students targeting public school undertaking the Kenya certificate of Primary Education. The preparations of the teachers were determined by the survey to be lacking hence hindering the manner in which content in Chemistry was being delivered. The tutors relied on the teacher focused delivery strategy. The survey found the mode of training that is in-service, not to be sufficient yet also there lacked sufficient inspiration for the learners and tutors alike. Mwingirwa (2019) set to examine how teachers were using technology in teacher preparedness in teaching Chemistry. The study measure teacher preparedness by examining the use of the available ICT resources and their relevance in terms of levels of training. The study took part in secondary schools in Tigania East district. The findings were that the secondary schools had a variety of ICT resources.

Support structures were also found to be available, according to 66.9% of the schools. Lack of mastery by tutors was discovered to be a contributing factor for the available ICT resources not being utilized. The major limitation identified by the study was lack of training, either in-service or pre-service. The study concluded that a lack of ICT adoption and its utilization by Chemistry teachers hindered its application in learning Chemistry at Tigania East district.

Gichuru and Ongus (2019) established that Chemistry performance of students in relation to the quality of the teacher. It targeted primary 6 students in private schools in Gasabo district in their national examination. The study noted that students performed highly when taught by

teachers with effective teaching practices compared to those who applied teaching practices that were ineffective. The pupil's performance was also impacted more by more experienced teachers compared to teachers who have just graduated. Students also performed highly from teacher who had good communication skills. Enhanced accomplishment in Chemistry was observed institutions where tutors showed commitment to assigned responsibilities, Chemistry teachers exhibited a positive attitude, better preparations were done ahead of teaching, relevant teaching resources were used and students were engaged through assessments and evaluation.

Makewa, Role, Too and Kiplagat (2019) conducted a study in primary schools to discern the association between the accomplishment of Chemistry and the commitment of teachers. The western region of Kenya was the area of the study targeting 74 Chemistry teachers and 280 class 8 students. The study found trained teachers within the area under study to have teaching experience ranging between 11 – 20 years. This was observed in public day primary schools. An average rating was observed on these variables: preparedness of teachers, utilization of learning resources by teachers, approaches of teaching and methods of assessment. A high rating was given by teachers in schools that performed highly on Chemistry assessment, preparedness by teachers, use of academic equipment's and approaches used in imparting knowledge.

Miheso (2022) argues that there is no one ultimate method of teaching that can be used in all occasions. On the other hand, Benson (2021) opines that scholars have identified predictors to poor performance. They include: ignoring use of learner-centered teaching approach, inadequate experiment sessions, and activities that practically model and inexperience in teaching Chemistry in schools. The mathematic accomplishment of students is significantly affected by the method of teaching/ giving instructions

(Eshiwani, 2021). According to Agezo (2010) and Dolton and Marcenaro-Gutierrez (2021), the learning outcomes of the students are greatly influenced by the teachers motivation. It is argued by Dolton and Marcenaro-Gutierrez (2021) nations where the motivation of teachers is poor record low performance from teachers which has resulted in poor outcomes in education.

Ochieng, Kiplagat and Nyongesa (2019) administered a survey in Nyatike Sub-county, Kenya. The survey examined accomplishments of learners in Chemistry in relation to the competence of the teachers. The study reviewed the Kenya Certificate of Secondary Examination results within public secondary schools within the area. The concepts considered by the study included the academic qualification of the teacher, training of the teacher, the experience of the teacher and performance of Chemistry as the dependent variable. A positive correlation was observed on: the academic qualification of the teacher in regards to accomplishment in Chemistry, training of the teacher in regards to accomplishment of Chemistry, experience of the teacher in relation to performance in Chemistry. A study carried out by Wanyonyi Kadian Wanyamaon impact of motivation as the human resource bundle on performace of teachers of public schools in Bungoma County, (Wanyama & Dankit Nassiuma, 2014) found out that with a unit increase in motivation, an increase of teacher performance by 19.5% was noted. Different ways that that a teacher could be motivated apart from monet are refresher courses offered by SMASSE and KESI, attendance of workshops or seminars in subject areas, provision of scholarships and study leaves and allowance of teachers to increase their education level. Promotions, paying on performance of job performnce, feedback and performance appraisals also improve teacher performance.

## **2.3 Theoretical Framework**

The formulation of these theories is meant to offer an explanation, anticipate and comprehend the occurrence and in various instances to provoke and expand current knowledge (Abend, 2020). The study was founded on the social cognitive theory, self- efficacy theory, Plato, and Socrates' Perspectives on teaching and learning.

### **2.3.1 Social Cognitive Theory**

It is emphasized by Bandura's social cognitive theory how factors such as environmental, personal, behavioral and cognitive interact to establish motivation, behavior and performance of an individual (Crothers, Hughes, & Morine, 2021). Four goal realization processes constitute the Social Cognitive Theory: self-observation, self-evaluation, self-reaction and self-efficacy. The named elements are interconnected, with each reacting to the attainment of goals and motivation (Redmond, 2020). According to Pajares and Achunk (2021), students who assumed the ability of accomplishing duties utilized more mental and meta-cognitive approaches and persevered longer. Below is an explanation of components of social cognitive process

Self-observation: Observing oneself evaluating one's advancement based on attainment of goals and also on inspiring change in behavior (Zimmerman & Schunk, 2021). Selfobservation allows a student to compare his present achievement in relation to anticipated achievements or grade. It is argued by Van der Bijl and Shortridge-Baggett (2020) that particular goals or grade identify how much endeavor is needed for the accomplishment and to help improve effectiveness due to advancement is not complicated to measure. Self-evaluation: There is a sense of satisfaction by students when they attain their valued and set goals. An individual

will more likely continue to put more effort if they have attained the goals they set out to achieve. If they only partially achieve this like in Chemistry performance, they will not be motivated to increase their effort (Bandura, 2021).

Self-reaction: if the advancement is regarded as suitable, then self-efficacy will be a feeling one will experience pertaining to continuing, and will be inspired towards the attainment of that goal or grades in future. When a learner has achieved a set Chemistry score, the standards will be raised most likely due to the re-assessment (grades); when a goal has not been attained by a person, most like re-assess themselves will occur and to reduce the expected (goal) to one that is attainable. Self-efficacy: a person's self-belief in the probability of accomplishing a goal can in itself inspire (Van der Bijl & Shortridge-Baggett, 2022). Self-efficacy is about judging a person on their ability to execute specific activities. Activities connected to self-efficacy enhance the attempts and tenacity towards tasks that are demanding; the likelihood of accomplishing these tasks is therefore increased (Axtell & Parker, 2019). Students understanding of their ability to execute tasks that are academic, predict their capability to accomplish such tasks (Bandura, 2021).

The concept of this theory will allow the study to examine the influence of a student attitude towards performance in Chemistry as well as the consequences of teacher related factors on student performance. Pajares (2019) argues that social cognitive perspective is the comprehension that a person understands that individuals are permeated with unique abilities. The key one is the ability to forecast and master over time. Students are able to use cognitive means due to these abilities to influence their academic excellence.

### **2.3.2 Self-Efficacy Theory**

Self-efficacy is the personal ability of the students to understand new ideas or acquire new knowledge in a specific area (Nasiriyah, Azar, Noruzi & Dalvand, 2021). Bandura defines self-efficacy as personal sense of accomplishing currently introduced tasks and roles under new environment (Snyder & Lopez, 2019). The personal abilities are a significant concept that stimulates the person and their acts as well as. Lunenburg (2021) opines that the belief of self-efficacy is an essential element in the motivation of humans and the behavior including how their actions are influenced. This has the ability to influence a person's self-efficacy over time therefore relating it to self-esteem. According to Van der Bijk and Shortridge-Baggett (2022), the theory of self-efficacy is based on the basic principle that individuals will probably take part in tasks that their self-efficacy is high and probably less take part in tasks which they don't.

Information is obtained by students to assess their effectiveness from real achievements in a particular subject, their secondary encounters or through others convincing them which propels their attempts, tenacity, resilience, and attainment (Bandura, 2019). This theory is suitable for the study because findings indicate that the capabilities of a person to learn determined by their effectiveness and also their achievement and motivation. It is the belief that they will succeed that will propel a person on certain tasks and responsibilities (Lunenburg, 2021). Hence student who believe they are good in Chemistry subject, will probably better perform in the subject unlike those who believe otherwise.

Redmond (2020) argues that the theory of self-efficacy is based on the basic idea of self-belief and accomplishment is relatively established by the ability of people to believe they can be effective. A person whose self-efficacy level is high is most likely to tackle hard tasks as

challenging instead of viewing it as an avoidable threat. If students perceive themselves weak in Chemistry eventually they are likely to perform poorly and put little efforts on the subject.

### **2.3.3 Plato and Socrates' Perspectives on Teaching and Learning**

Maganga (2019) while analyzing Plato and Socrates work, pointed out that, thoughts or basic notions behind the existing entities are usually felt by perception, through questions that evoke knowledge or comprehension of thoughts behind solid circumstances. The implications of this are that teachers need to provide students with more Chemistry assignments, which will help in stimulating their minds to comprehend the concepts of Chemistry. This means that students can be transformed into good mathematicians when their teachers grant them additional questions to stimulate their minds to appreciate and understand concepts of Chemistry for improved performance.

Lynda (2019) asserts that, a lot of time and resources are utilized by public schools in curriculum development and approval yet little is utilized on facets of pedagogy including actual teaching to instill knowledge and understanding. Teachers offer guidance to students on what to learn while books exist so that learners can explore their content and answer end of chapter questions or questions in an examination. A lot of time is utilized on mechanical learning with little time utilized on comprehension emanating from making relationships, coherence, understanding and critical thinking.

Many schools lack specialists' modalities in teaching and learning yet they have acquired the services of many specialists in curriculum. The schools know what needs to be done and what content can be supported but lacks the knowledge in how to well coordinate, train and develop, and inspire a liking and desire to learn since this is absent in the learning experience (George, 2019). This could partly explain the reasons behind poor achievement in Chemistry as a field.

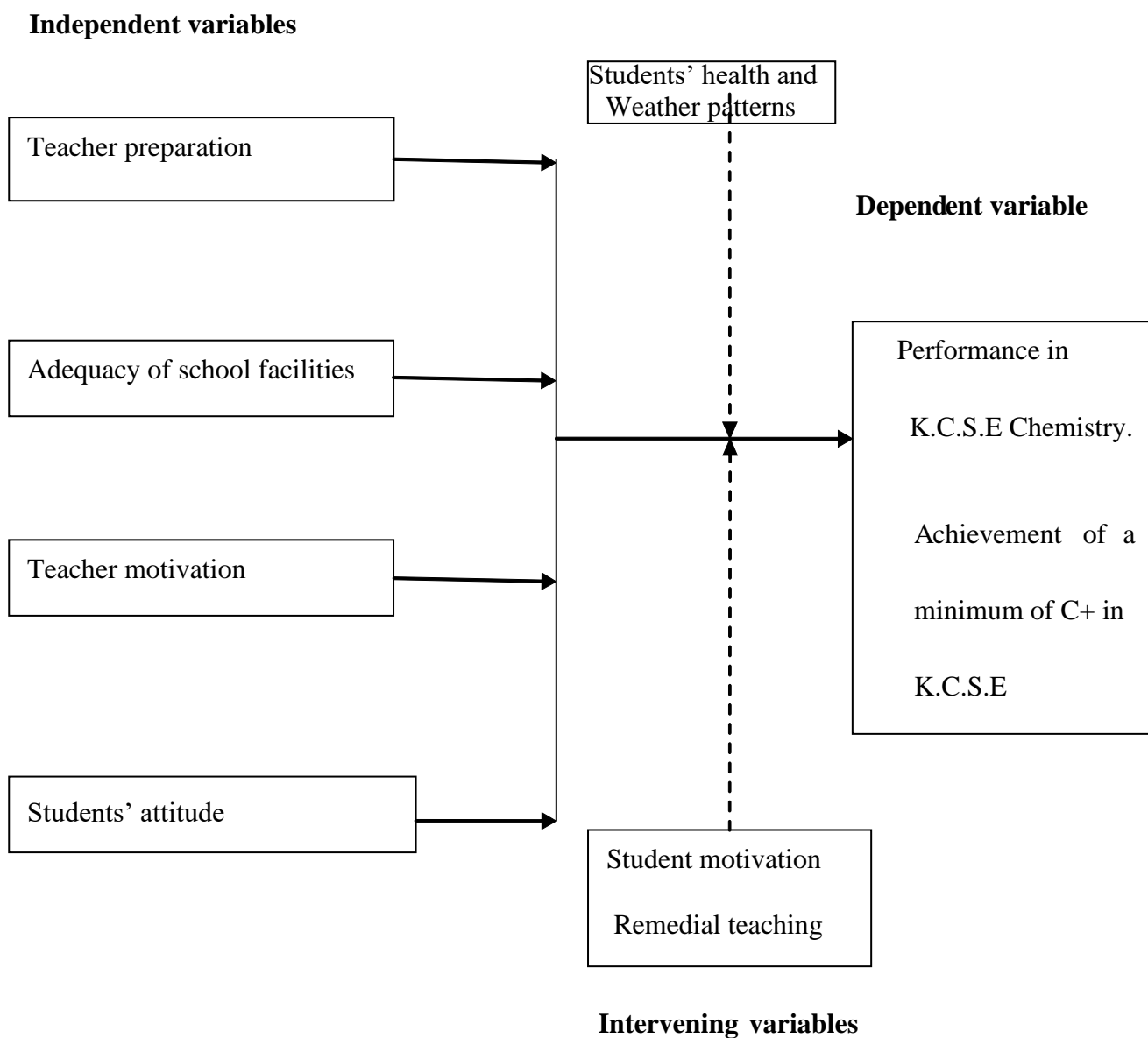
This theory will enable the study in understanding how availability and effective utilize equipment's for learning and teaching, teacher's preparedness, experience, teaching methods and motivation influence students' performance in Chemistry subject.

## **2.4 Conceptual framework**

The study seeks to examine the factors that affect performance of students in public schools in Mukaa Sub County in Chemistry. Performance in Chemistry is linked to various variables like: presence of resources like, libraries, laboratories, laboratory materials and textbooks, teacher preparedness values such as instruction style, experience, gender and sensitivity, teachers' motivation that is their interests and ability of the learner both in spatial and scientific. Extraneous variable includes weather patterns and student health.

Figure 3 shows the relationship that exists between variables influencing achievement of scores above C+ in Chemistry. The head of the arrow symbolizes direction of the effect.

**Figure 3: Conceptual framework showing relationship between variables**



## 2.4 Variables

The Independent variables which include, teaching methods, adequacy of school facilities such as apparatus and text books, motivation of the teacher of Chemistry and the learners' attitude towards the subject. Extraneous variables used in the study include weather patterns

and students' health while intervening variables used were remedial learning and students' motivation. When put in place results into improved performance indicated through students' achievement of a minimum of C+ in K.C.S.E Chemistry.

## **CHAPTER THREE**

### **RESEARCH METHODOLOGY**

#### **3.0 Introduction**

This section highlights or discusses how the study was conducted. It outlines the procedure and strategies which were used to collect and analyze data. It consists of the description of the research design, variables considered, location of the study, target population, sample size and techniques, research instruments and their validity and reliability, data collection procedures and data analysis.

#### **3.1 Research design**

The study adopted a descriptive survey design method as it would deal with people's views and hence it was relevant to the study area. According to Grazino and Raulin (2020), descriptive survey method is often used to study people's feelings, thinking and attitudes about specific aspects hence was relevant for this study as attitudes could not be directly measured or observed but could be inferred from certain cues which depicts the implicit nature of student's characteristics. The research aimed at capturing some of the student attitudes towards Chemistry. The data was obtained through the use of student and teachers questionnaires representing various attitude variables or themes and Classroom Observation Schedule. Interview schedule was used to collect data from head teachers. The student's response was organized and analyzed both in qualitative and quantitative approaches then summed up in a descriptive manner according to the themes

### **3.2 Location of study**

The study was carried out in 12 public secondary schools, Mukaa Sub County, Makueni County. Makueni County is a county in the former Eastern Province of Kenya. Its capital town is Wote. The largest town is Emali town, which is also an important market and stop over for the Standard Gauge Railway (SGR). Emali town is multicultural and adds diversity to Makueni county. The county has a population of 987,653 (2019 census). The county lies between Latitude 1° 35' and 2° 59' South and Longitude 37° 10' and 38° 30' East. It borders Machakos County to the North, Kitui County to the East, Taita Taveta County to the South and Kajiado County to the West and covers an area of 8,008.9 km<sup>2</sup>. There are 78 ECD centres 997 primary schools and 375 secondary schools. The county has also 3 teachers training colleges, 37 Youth Polytechnics, 231 adult training institutions, 2 technical training institutions, 3 university campuses. This area was selected due to the poor chemistry performance in the public secondary schools as compared to neighboring areas in the region (Makueni County Education Office, 2022).

### **3.4 Target Population**

The target population according to Orodha (2019) is an augmentation of entities that hold the information being sought. The targeted population comprised of head teacher, students in Form 4 and tutors teaching Chemistry within the public secondary school in Mukaa Sub-County since they could easily relate to the trends in Chemistry performance in their schools and have easy access to the required data. There were 35 public secondary schools in Mukaa Sub-County with 35 head teachers, 220 Chemistry teachers and a population of 28,567 students as shown in Table 3.1.

**Table 3.1.**

**Target Population**

<b>Category</b>	<b>Population</b>
Head Teachers	35
Chemistry teachers	220
Students	28,567
<b>Total</b>	<b>28,822</b>

Source: Makueni County Education Office 2023

**3.3 Sampling procedures and Sample size**

The sampling technique adopted by the study was the multistage approach. It assisted in deriving the study sample. Multistage sampling approach is a technique where the sample becomes smaller as it moves from stage to stage. According to Burns (2010), two-stage sampling technique involves first selecting a primary sample unit then deriving a secondary sample unit from the individual primary units. In this study, Slovins formula was used to come up with representative sample.

$$n=N / (1 + N e^2)$$

Where: n= sample size, N= population and e=margin of error

Therefore, in a population of 244,

$$12=35/ (1+35*0.05)$$

The study therefore involved 12 secondary schools. Purposive sampling was deployed in each school to recruit, Head teachers, teachers and students. Purposive technique of sampling is a non-probability sample methodology where a sample is arrived at depending on the features of the population and the study objectives. This method was preferred to enable the sample include teachers and students from all sampled schools. Using this method, the researcher purposively sampled the head teachers and 2 chemistry teachers from each of the participating schools.

In addition, the researcher purposely selected 10 form four learners within each of the 12 public secondary schools.

**Table 3.2.**  
**Sample Size**

<b>School</b>	<b>Head Teachers</b>	<b>Teachers</b>	<b>Students</b>
<b>1</b>	<b>1</b>	<b>2</b>	<b>10</b>
<b>2</b>	<b>1</b>	<b>2</b>	<b>10</b>
<b>3</b>	<b>1</b>	<b>2</b>	<b>10</b>
<b>4</b>	<b>1</b>	<b>2</b>	<b>10</b>
<b>5</b>	<b>1</b>	<b>2</b>	<b>10</b>
<b>6</b>	<b>1</b>	<b>2</b>	<b>10</b>
<b>7</b>	<b>1</b>	<b>2</b>	<b>10</b>
<b>8</b>	<b>1</b>	<b>2</b>	<b>10</b>
<b>9</b>	<b>1</b>	<b>2</b>	<b>10</b>
<b>10</b>	<b>1</b>	<b>2</b>	<b>10</b>
<b>11</b>	<b>1</b>	<b>2</b>	<b>10</b>
<b>12</b>	<b>1</b>	<b>2</b>	<b>10</b>
<b>Total</b>	<b>12</b>	<b>24</b>	<b>120</b>

The study therefore had respondents totaling a hundred and fifty-six, derived from twelve Head teachers, twenty-four tutors teaching Chemistry and a hundred and twenty learners.

### **3.4 Research instruments**

The study used questionnaires, interview schedules and an observation checklist. Self-administered questionnaires were used for data collection from head teachers, Chemistry teachers and students. A Questionnaire is a tool for collection data where the respondents targeted are required to react to a similar cluster of inquiries in a sequence that is predetermined (Sekaran, 2019). Information obtained by use of questionnaires is exempt from prejudice and not influenced by the researcher (Kothari, 2019). A Likert five-point scale was

deployed within the questionnaire with a scale between 1-5 where, 5= Strongly Agree, 4=Agree, 3=Neutral, 2= Disagree, while 1=Strongly Disagree.

The study adopted interview schedules to acquire data from department heads. Interview schedules generally are a compilation of questions in a list format prepared to lead the interviewer in acquiring the required data from the interviewee on a particular issue or topic (Burns, 2020). An interview schedule is preferred as it is able to procure comprehensive information on an individual emotion, understanding and perspective. It also permits for additional probing on that topic or issue and often attains a response rate that is high.

An observation checklist utilized to acquire data on teaching resources. A template of the checklist used is attached in Appendix IV. With direct observation, the researcher was able to obtain first-hand knowledge and information about teaching and learning resources.

A pilot study was a compact study done before hand to assess the viability, timeliness and financial implications, to predict appropriateness of the tool of research, the questions had to be clear and the design of the study predetermined prior to the actual study. Fendler (2019) proposed that in a pilot study, an adequate number of participants range from 10 to 30. Participants totaling thirty were utilized to provide an upper limit of the pilot study which was undertaken in 5 secondary schools picked randomly from Mukaa Sub-County. A test of reliability was provided by the pilot study hence enhancing the acquisition of data by the research tool through offering clarity in the questions asked and by providing it with the capability to acquire relevant data.

### **3.5 Validity and reliability of research instruments**

#### **3.5.1 Validity of Research Instruments**

The data acquired was needed to not only pass the reliability test but also be precise, accurate and valid. Validity is a measure of the degree at which a research tool can measure what it's required to measure (Frankfort-Nachmias & Nachmias, 2020). According to Mugenda and Mugenda (2020), instrument validity can be enhanced by the input of experts. To improve on validity of research instrument the researcher's supervisors reviewed the instrument and made recommendations, which were adopted. This assisted in improving the content validity of data collected by ensuring the research tool was revised and modified hence meeting the standards. After pilot study, the questionnaires were revised with pointed out corrections to capture required feedback.

#### **3.5.2 Reliability of Research Instruments**

It is paramount for a researcher to subject the research tool to a test for its validity and reliability before subjecting it to acquisition of data in the field. The study subjected its research instrument to data reliability and data validity for purposes of maintaining data accuracy. Data reliability is the level at which a tool of research conveys consistent outcome when replicated. Reliability is concern with generating resemblance and accuracy. In research, reliability is concern with the capabilities to reproduce the same outcomes within a homogenous population given the circumstances is similar. This notion of research makes it replicable. The research tool used in the study was subjected to a pretest to ensure replicability. A Cronbach Coefficient score of 0.74 was achieved in the study indicating adequate reliability.

### **3.5.3 Pilot study**

This includes pre-test and test-retest techniques used to determine validity and reliability of the instrument respectively which was done before the actual data collection. A pilot study was conducted in 3 schools which were not among the sampled but had the same characteristics with the sampled schools to check the viability, validity and reliability of the research instruments. The pilot study was a success

### **3.6 Data collection procedure**

The researcher obtained permission from the School of Education and a clearance letter from the university department of postgraduate studies permitting the researcher to conduct the study.

To collect the data, the researcher obtained a letter of clearance from NACOSTI to allow the researcher to carry out the study. The researcher interviewed the participants to collect data from the teachers while at the same time capturing the data in a questionnaire. The interviews were to help the researcher seek more explanations and clarifications of responses given by the respondents. The questionnaires enabled the researcher to capture the details and record the responses in a systematic way that could be transferred into analysis software without strain for analysis. Other questionnaires were distributed to some of the sampled schools with the permission from the schools' authorities and the teachers concerned or assistant. This saved on research time and cost. Co-ordination was done so as to establish the appropriate time to administer the questionnaires to students i.e. when the students were free. The teacher concerned would break the tension that the respondent anonymity was assured and that the work was only meant for research, then distributed the questionnaire to the right group, supervised and collected all of them when they were through. The form four students were

randomly selected depending on the number required. The completed questionnaires were then kept safely for the researcher to pick.

### **3.8 Data analysis**

Creswell (2020) argues that the analysis of data is the reorganization of raw data for purposes of making sense of it. The end product in this process is information that is relevant to the data provided. Data analysis involves a set of activities that begins with the collection of data and ends with a detailed presentation of the findings. The collected data is assessed and bits of information compiled in the entire process. Shamoo and Resnik (2019) opines that there exist several steps of analysis. The raw data acquired from the study area is challenging to evaluate therefore it was cleaned, locked, key pinched into computer using SPSS version 24.

The researcher used descriptive statistics comprising frequencies, percentages, mean and standard deviation. Chi-square tests were used to establish relationships between student attitude, adequacy of teaching and learning resources, teachers' preparedness, and workload on Chemistry performance in KCSE among learners in public secondary schools in Mukaa Sub-County. The findings were presented in form of tables.

### **3.9 Ethical Consideration**

In Kenya, the National Commission for Science and Innovation (NACOSTI) is the body mandated by the relevant Ministry to facilitate research. The researcher therefore contacted NACOSTI seeking authorization to conduct research and to collect data within Mukaa Sub-County which is in Kenya. The researcher maintained privacy by collecting information anonymously since respondents were not required to indicate their names in the questionnaire. Approval was sought from Lukenya University and the principals of participating schools in order to get permission to collect data from the teachers and students who were under 18 years.

The purpose of the study was also disclosed to the respondents with an assurance that data provided would only be used for academic purpose. The researcher also obtained consent from the respondents and participation in the study was voluntary.

### **3.10 Summary**

This chapter details the research methodology of the study and covers research design used, target population, sampling technique applied, methods of data collection, research validity and reliability, operational definition of variables and lastly looks at data analysis procedure.

## CHAPTER FOUR

### DATA ANALYSIS, PRESENTATIONS AND INTERPRETATION

#### 4.1 Introduction

The chapter presents an analysis of the data collected from a sample of 120 students from 12 public secondary schools, 24 Chemistry teachers and 12 head teachers. Methods that were used during analysis are calculation of percentages and use of representative tables.

#### 4.2 Response Rate

A total of 132 questionnaires were returned out of a possible 156 representing a 85% response rate. This was a high response rate as it is greater than the 70% recommended for descriptive studies.

**Table 4.1.**

Response Rate

Population	Questionnaires distributed	Questionnaires returned	Response rate (%)
Head teachers	12	9	75
Chemistry teachers	24	20	83
Students	120	103	86
Total	156	132	85

#### 4.3 Socio-Demographic Characteristics of Respondents

Socio-demographic characteristics in the study included gender, age, level of education and experience of teaches. The findings are presented in Table 4.2. Majority 72% (15) of the respondents in the study were male. This shows that there was great gender disparity among teachers of Chemistry of public secondary schools in Mukaa Sub-County. Slightly above half 52% (n=11) of the respondents were aged between 31 and 40 years while 28% (n=6) were

aged between 21 and 30 years. This shows that Chemistry teachers of public secondary schools in Mukaa Sub-County were relatively young.

The findings show that slightly above half 52% (n=11) of the respondents in the study had acquired a degree while 38% (n=8) had acquired a bachelor's degree. This shows that Chemistry teachers of public secondary schools in Mukaa Sub-County were trained as all of them had acquired post-secondary education. Slightly less than half 47% (n=10) of the respondents had a working experience of between 11 and 15 years while 38% (n=8) had a working experience of between 6 and 10 years. This shows that the respondents were experienced enough to enable them respond resourcefully to the questions in the study.

**Table 4.2.**

**Socio-Demographic Characteristics**

Characteristic	Category	Frequency	Percentage
Gender	Male	15	72%
	Female	6	28%
	Total	21	100%
Age (years)	21-30	6	28%
	31-40	11	52%
	41-50	3	12%
	>50	2	8%
	Total	21	100%
Level of education	Diploma	11	52%
	Bachelor's degree	8	38%
	Post graduate degree	2	10%
	Total	21	100%
Teaching experience	<5	1	3%
	6-10	8	38%
	11-15	10	47%
	>16	3	12%
	Total	21	100%

#### **4.4 Students Attitude towards Chemistry and Performance in Chemistry**

The study sought to find out students' attitude towards Chemistry in order to assess the influence of student's attitude on Chemistry performance in KCSE among learners in public secondary schools in Mukaa sub-county. The findings are presented in this section.

##### **4.4.1 Teachers' Responses on Students Attitude towards Chemistry**

(68%) of the teachers in the study disagreed that students generally like Chemistry and believe they will get good grades however 32% of the respondents disagreed. The vast (96%) agreed that Chemistry usually makes students feel uncomfortable and nervous during Chemistry lessons and test leading to poor performance however, 4% of the teachers disagreed. (62%) also agreed that Chemistry teachers have built confidence of their students on their ability to pass well in KCSE. However, 36% disagreed and 2% of the respondents were uncertain. In addition, the vast (93%) of teachers agree that many students feel they have no ability or talent to succeed in Chemistry however 6% of the respondents disagreed.

Slightly above half (55%) disagreed while 45% agreed that learning Chemistry involves a lot of memorization of formula which are difficult to grasp and Many times miss Chemistry lessons because the subject is difficult. Similarly, 84% disagreed, 12% agreed and 4% were uncertain that Chemistry is too complex and it is difficult to pass Chemistry it in KCSE especially in this school. It is normal that majority of students fail in the subject. The vast (98%) agreed that students' attitude towards Chemistry greatly influences their performance on the subject. However, 2% of the respondents were uncertain.

The findings therefore show that students generally had negative attitudes towards chemistry subject and they found it as a complex subject. This is in agreement with Aqajani *et al.*, (2019) finding that students' anxiety in Chemistry was strongly predicted by emotional self-efficacy,

learning self-efficacy and self-confidence. These results also are also in tandem with the findings of Nikmanesh and Yari (2019) which showed an association between anxiety in exams and self-efficacy. Also, it found a significant association between the 3 elements (aggressive perception, acting perception, & passive perception) of self-perception with anxiety in exams.

**Table 4.3.**

Teachers' Responses on Students Attitude towards Chemistry

Statement	SA		A		U		D		SD	
	%	N	%	n	%	N	%	N	%	n
Students generally like Chemistry	22	4	10	2		0	20	4	48	
Chemistry usually makes students feel uncomfortable and nervous during Chemistry lessons and test leading to poor performance	56	11	40	8		0	4	1		
Chemistry teachers have built confidence of their students on their ability to pass well in KCSE	44	9	18	4	2	0	18	4	18	
Many students feel they have no ability or talent to succeed in Chemistry.	56	11	38	8		0	4	1	2	
Learning Chemistry involves a lot of memorization of formula which are difficult to grasp and Many times miss Chemistry lessons because the subject is difficult	25	5	20	4		0	38	8	17	
Chemistry is too complex		0	12	2	4	1	28	6	56	
Students attitude towards Chemistry greatly influences their performance on the subject	78	16	20	4	2	0		0		

Key: SA = strongly agree, A = Agree, U= Uncertain, D= disagree, SD = Strongly disagree

#### 4.4.2 Students' Responses on Attitude towards Chemistry

(68%) of the students in the study agreed that Chemistry is too complex and it is difficult for them to pass however, 32% disagreed to this. (60%) disagreed, 34% agreed while 6% were uncertain that Chemistry doesn't scare them at all and they believe that they would get good grades. The findings show that (80%) of the students agreed while 20% disagreed that Chemistry usually makes them feel uncomfortable and they get nervous during Chemistry lessons and tests. In addition, slightly above half (57%) of the students disagreed, 39% agreed and 4% were uncertain that they had no confidence in tackling Chemistry related problems.

The findings show that (63%) of the respondents agreed, 35% disagreed while 2% were uncertain that they had no ability or talent to succeed in Chemistry. (71%) of the students agreed while 29% disagreed that Chemistry teachers had made them feel that they had the ability to pass well in Chemistry. (75%) also agreed and 25% disagreed that Chemistry is a worthwhile and necessary subject. However, slightly above half (58%) of the respondents disagreed, 39% agreed and 1% were uncertain that Chemistry is of no relevance to them and they expected to have little use for it when they get out of high school.

The findings therefore show that students had not only a negative attitude but also fear of Chemistry. This is consistent with Ernest (2022) finding that its very likely, the public image of Chemistry is labeling it as a difficult, cold, abstract, theoretical and ultra-rational subject. It is also aligned with the findings of Manoah *et al.*, (2021) in their study observed that attitudes played a critical role in students' performance. Students with positive attitude tended to perform well in an exam. It is however in contrast to findings of Fan, Quek, Yan, Mei, Lionel and Yee, (2019), Yilmaz *et al.*, (2020) and Tezer and Karasel, (2020) which indicated the attitude of students towards Chemistry to be relatively positive.

The negative attitudes and phobia towards Chemistry among the students could be attributed to the culture of failing Chemistry in the study area. Traditionally, Chemistry has been a poorly performed subject and as such students hold the belief that they will eventually fail. Benchmarking with schools which pass in Chemistry can be used to solve this problem. In addition, rewards for students who do well in Chemistry should be introduced.

**Table 4.4.**  
**Students' Responses on Attitude towards Chemistry**

Statement	SA		A		U		D		SD	
	%	<u>n</u>	%	<u>N</u>	%	<u>n</u>	%	<u>N</u>	%	<u>N</u>
Chemistry is too complex	43	44	25	26		0	16	16	16	16
Chemistry doesn't scare me at all	24	25	10	10	6	6	38	39	22	23
Chemistry usually makes me feel uncomfortable	57	59	23	24		0	16	16	4	4
I have confidence in tackling Chemistry	22	23	17	18	4	4	19	20	38	39
I have no ability or talent to succeed in Chemistry	25	26	38	39	2	2	23	24	12	12
Chemistry teachers have made me feel I have the ability to pass well in Chemistry	33	34	38	39		0	22	23	7	7
Chemistry is a worthwhile and necessary subject	48	49	27	28		0	23	24	2	2
Chemistry is of no relevance to me	1	1	38	39	3	3	31	32	27	28

Key: SA = strongly agree, A = Agree, U= Uncertain, D= disagree, SD = Strongly disagree

#### 4.4.3 Heads Responses on Students Attitude towards Chemistry

(67%) of the heads teachers indicated that students have a negative attitude towards Chemistry. Some of their responses are captured below:

*“In my opinion, most students adopt a negative attitude towards Chemistry due to the notion that Chemistry is difficult.”*

*“The attitude towards Chemistry is not taken positively because Chemistry is a hard subject”*

*“Students’ attitude towards Chemistry is positive they just lack the confidence to approach and tackle it”*

The findings therefore show that there was a general negative attitude towards Chemistry among the students. This is in tandem with findings of Ernest (2022); Nui and Wahome (2020); Manoah *et al.*, (2021); Nikmanesh and Yari (2019) and Aqajani *et al.*, (2019) which showed that students harbored negative attitudes towards Chemistry. The finding is however different from findings of Fan, Quek, Yan, Mei, Lionel and Yee, (2019), Yilmaz *et al.*, (2020) and Tezer and Karasel, (2020) which indicated the attitude of students towards Chemistry to be relatively positive.

Schools should therefore adopt new strategies of motivating students to learn Chemistry thereby reducing the phobia that they have against Chemistry. This can be done for example by using outdoor activities. Teachers should also be given refresher training to enhance their mastery of content and ability to use various learning styles to motivate students (Zahyah, 2020; Kamau, 2019).

**Table 4.5.**

**Head Teachers Responses on Students Attitude towards Chemistry**

Response On Attitudes	Frequencies	Percentage
Positive	3	33
Negative	6	67
Total	9	100

#### **4.6 Teaching Resources and Performance in Chemistry**

The study sought to establish the availability and adequacy of teaching resources in the participating schools in order to determine how teaching and learning resources influence

Chemistry performance in KCSE among learners in public secondary schools in Mukaa sub-county.

#### **4.6.1 Teachers' Responses on Teaching Resources**

(71%) of the teachers in the study agreed while 29% disagreed that inadequacy of textbooks, revision materials and limited access to library materials hinders effective teaching and learning of Chemistry. Slightly above half (58%) agreed, 38% disagreed and 4% were uncertain that there is a friendly and cooperative relationship between

Chemistry teachers and the students which makes the subject enjoyable. However, (84%) of the teachers disagreed while 16% agreed that the school has adequate infrastructure (Classes, desks, library) and Chemistry teachers have adequate workspace for preparation, collaboration or meeting with students. The findings show that the vast (92%) of teachers agreed, 6% were uncertain and 2% disagreed that teaching methods in Chemistry is student centered and participatory which have enhanced student understanding on complex Chemistry concepts. The vast (92%) also agreed, 6% disagreed and 2% were uncertain that availability and effective utilization of teaching and instructional materials have a great potential of improving performance in Chemistry in KCSE.

The findings therefore suggest that teaching resources were inadequate and this had an influence on performance of students in Chemistry. This finding is in tandem with findings of Akungu (2019) who established that a lack of enough resource both material and physical is a vital component accountable for the students' learning outcomes. Schools with inadequate structures including materials for supporting teaching and learning, classrooms, laboratories and workshops are not likely to produce results that are good. The finding is also in tandem with Lyons (2019) finding that schools become enhanced and effective through the available

TLR. This is because, these are essential resources that institute academic performance that is good for the students. Lack of conducting proper background preparation by a Chemistry teacher, inadequate equipment's of teaching Chemistry and material are some factors that have been cited to be promoting bad results in Chemistry due to demotivation of students (Gathua, 2021).

**Table 4.6.**  
**Teachers' Responses on Teaching Resources**

Statement	SA		A		U		D		SD	
	%	N	%	N	%	n	%	n	%	n
Inadequacy of textbooks, revision materials and Limited access to library	44	9	27	5		0	20	4	9	2
Friendly and cooperative relationship between teachers and the students	38	8	20	4	4	1	26	5	12	2
The school has adequate infrastructure	8	2	8	2		0	37	7	47	9
Teaching method in Chemistry is student centered and participatory	62	12	30	6	6	1	2	0		0
Availability and effective utilization of teaching and Instructional materials	82	16	10	2	2	0		0	6	1

Key: SA = strongly agree, A = Agree, U= Uncertain, D= disagree, SD = Strongly disagree

#### 4.6.2 Head Teachers Responses on Teaching Resources

Slightly above half (56%) of the Chemistry heads of departments in the study indicated that there was a fair availability of Chemistry teaching resources. This suggests the inadequacy of Chemistry teaching resources which may influence teaching and Chemistry achievement of students. This is in agreement with The Organization for Economic Co-operation and Development (OECD) (2019) who show inadequate resources impede teaching and lowers performance of students. It is also in agreement with Githua (2021) who posited that lack of conducting proper background preparation by a Chemistry teacher, inadequate equipment's of teaching Chemistry and material are some factors that have been cited to be promoting bad

results in Chemistry. Lyons (2022) posits that learning is a multiplex venture that includes interaction of teaching skills and demands of curriculum, physical structures, resources for teaching and motivation of students. Schools become enhanced and effective through the available TLR. This is because, these are essential resources that institute academic performance that is good for the students.

**Table 4.7.**  
**Head Teachers Responses on Teaching Resources**

Response	Frequency	Percentage
High	2	22
Fair	5	56
Low	2	22
Total	9	100

#### **4.6.3 Researcher’s observations of Teaching Resources**

Using an observation checklist, the researcher checked the availability, condition and adequacy of Chemistry teaching resources. The findings show that Chemistry textbooks, reference books and geometric equipment were found in all participating schools. Majority of the teaching resources were in a good or fair condition. However, majority of resources such as computers with Chemistry related programs, Geometric equipment, modern teaching aids and Chemistry textbooks had a low adequacy.

The findings therefore show a high availability but low adequacy of teaching resources. This is consistent with World Education Forum in Dakar (2020) finding that resources are not effectively utilized by most teachers and where they are available they are very little used.

This is because globally a third of secondary schools lack access to technologies and skills that could assist enhance the knowledge acquisition process.

The finding is also consistent with findings of Johan (2019), Momoh (2020) and Lyons (2022) who also found high inadequacy of teaching resources.

**Table 4.8.**  
**Researcher’s observations of Teaching Resources**

Item	Availability				Condition				Adequacy							
	Yes		No		Good		Fair		Bad		High		Fair		Low	
	%	N	%	N	%	N	%	N	%	N	%	n	%	n	%	N
Chemistry textbooks	100	12	0	0	73	9	18	2	9	1	9	1	18	2	63	8
Modern teaching aids	55	7	45	5	63	8	27	3	0	0	27	3	27	3	46	6
Calculators	91	11	9	1	82	10	18	2		0	37	4	63	8		0
Chemistry reference books	100	12	0	0	9	1	73	9	18	2	36	4	9	1	5	1
Chemistry posters and charts	100	12	0	0	73	9	18	2	9	1	82	10	9	1	9	1
Geometric equipment	100	12	0	0	55	7	27	3	18	2	18	2	9	1	73	9
Computers with Chemistry related programs	36	4	64	8	55	7	45	5	0	0	9	1	0	0	82	10

## **4.7 Teacher Preparedness and Performance in Chemistry**

The study assessed teacher preparedness and workload in order to evaluate the effects of teachers' preparedness and workload on Chemistry performance in KCSE among learners in public secondary schools in Mukaa sub-county.

### **4.7.1 Teachers' Responses on Preparedness and Workload**

(80%) of the respondents disagreed while 20% agreed that they do not have adequate time to prepare lesson plans. The vast (97%) agreed while 3% were uncertain that Chemistry teachers-student ratio is high, making it impossible for the teacher to interact with students at a personal level. However, 71% of the teachers disagreed while 29% agreed that Chemistry teachers and students were rewarded whenever improvement in performance was noted to appreciate them and maintain morale. Slightly above half, (54%) agreed, 34% disagreed and 12% were uncertain that inadequate preparation lack of motivation to both teachers and students and high teacher workload have contributed to dismal performance in Chemistry subject.

The findings therefore signify a poor preparedness of teachers in Chemistry brought about by heavy workload. This is consistent with findings of UNESCO (2019) which found that the Chemistry curriculum was ineffectively being implemented because of inadequacy of teachers who are properly trained, lack of proper techniques in teaching, insufficient supply of equipment's that are relevant and inadequate growth of the culture of Chemistry. It is also consistent with Dolton and Marcenaro-Gutierrez (2021) observations that countries where the motivation of teachers was low also recorded low performance from teachers which translated to educational outcomes which are poor.

**Table 4.9.****Teachers Responses on Preparedness and Workload**

Statement	SA		A		U		D		SD		M	StD
	%	n	%	N	%	n	%	N	%	n		
Adequate time to Prepare lesson plans	16	3	4	1		0	23	5	57	11	4.4	0.809
Teachers-student ratio is high	82	16	15	3	3	1		0		0	1.64	0.702
Teachers and students are rewarded	23	5	16	3		0	27	5	44	9	3.92	1.009
Inadequate preparation lack of motivation to both teachers and students	27	5	27	5	12	2	23	5	11	2	2.3	1.211
Average											3.07	0.933

Key: SA = strongly agree, A = Agree, U= Uncertain, D= disagree, SD = Strongly disagree, M= Mean & Std = Standard Deviation

**4.7.2 Head teachers responses on teacher Preparedness and Performance in Chemistry**

(78%) of the heads of departments indicated that teachers were well prepared to teach Chemistry. Some of the responses are captured below;

*“Most Chemistry teachers are prepared well enough to teach the subject. What lacks is the preparedness from the student together with interest”*

*“Some teachers come to teach being prepared ton which topic ad assignments they will take”*

*“Teachers are well prepared in teaching Chemistry since the students depends on them for their performance”*

These findings are in contrast to those of teachers, which indicated poor preparedness.

The findings are therefore in contrast to those of Nye, Konstantopoulos and Hedges, 2019; and Jackson (2022) which found poor preparedness of Chemistry teachers. Student performance that was high was registered by teachers whose teaching practices were effective as opposed to those whose teaching practices were considered ineffective. Also, the

performance of students was impacted more by teachers with more experience in teaching as compared to fresh graduates. Teacher preparedness enables effective teaching of Chemistry which motivates students which translates to better performance in the subject (Gichuru & Ongus, 2019).

**Table 4.10.**

**Heads responses on teacher Preparedness and Performance in Chemistry**

Response	Frequency	Percentage
Well prepared	5	56
Fairly well prepared	4	44
Total	9	100

**4.8 Performance in Chemistry in KCSE**

Performance in Chemistry among participating schools was noted over a period of 5 years in order to assess how student attitude, adequacy of teaching and learning resources and teachers' preparedness, and workload influence Chemistry performance in KCSE among learners in public secondary schools in Mukaa Sub County. Findings in Table 4.14 show that the participating schools consistently performed poorly over the study period with a mean grade of D- each academic year.

**Table 4.11.**

**Performance in Chemistry in KCSE**

Academic	Mean average	Grade
2019	2.28	D-
2020	2.46	D-
2021	2.41	D-
2022	2.48	D-
2023	2.53	D-

## 4.6 Teaching method mostly used by Chemistry teachers

### 4.6.1: Teacher preparedness from students' questionnaire

Learners were asked to indicate the teaching methodologies used by teachers in teaching Chemistry. The findings were analyzed in Table 4.5 Table 4:5: Teaching methods and teachers preparedness responses from students' questionnaire.

Teaching method	Frequency	Percentage(%)
Lecture	0	0
Demonstration	29	72.5
Question and answer	9	22.5
Discussion	2	5
Total	40	100

Of the four types of teaching methods, the teachers did not use lecture method, and discussion was the second lowest. Demonstration was the mostly used method with 72.5% followed by question-and-answer method with a score of 22.5%. Teachers opted to have demonstrations and question and answer method despite the fact that, from their perspective, their laboratories are well equipped. Chemistry, being a science subject needs a more hands on approach. This may have affected performance in the subject.

### 4.6.2 Teaching methods responses from teachers' questionnaire

Teachers were asked to indicate the teaching methodologies used by teachers in teaching Chemistry. The findings were presented in Table 4.6.

**Table 4:12: Teaching methods responses from teachers' questionnaire.**

<b>Teaching methodology</b>	<b>Frequency</b>	<b>Percentage(%)</b>
Teacher demonstration experiments:	2	12.5
Student's practical's	3	18.75
Lecture method	2	12.5
Question and answer method	9	56.25
Total	16	100

Each teacher generated four responses bringing the total to 16 responses. From the teacher's questionnaire, it is evident that question and answer method is the most commonly used at 65% followed by students' practicals at 15% which should be the preferred mode of teaching as Chemistry is a Science whose understanding should be based on practical knowledge. Lecture method and teacher demonstration were the least at 10%.

A 100% of head teachers responded that the most common teaching method was teacher demonstration.

#### **4.7 Students' career aspirations**

Students were asked to indicate their future career aspirations. The findings are represented in table 4.13.

**Table 4:13: Students' career aspirations**

<b>Occupation</b>	<b>Frequency</b>	<b>Percentage (%)</b>
Medical Doctor	14	35
Journalist	6	15
Nurse	5	13
Pilot	4	10
Engineer	3	8
Surveyor	2	5
Veterinary officer	2	5
Researcher	1	3
Architect	1	3
Clinical officer	1	3
Teacher	1	3
Total	40	100

Out of the 12 careers students were interested in, only two careers; journalism and surveyor are not exclusively science oriented. Many students therefore would like to branch into careers, such as medical doctor, nurse, pilot, engineering, veterinary officer, researcher, architect, clinical officer, and teaching, that would require the knowledge of Chemistry but from an earlier finding represented in Table 4.7 on whether they think Chemistry will lead to a good future ,75% of the students strongly disagreed that knowledge of the subject would lead to a good future.

#### 4.8 Factors affecting the performance in Chemistry

Teachers were asked to indicate the factors affecting performance in Chemistry. The findings are presented in Table 4.14.

**Table 4:14: Factors affecting performance of students in Chemistry**

<b>FACTORS</b>	<b>Frequency</b>	<b>Percentage(%)</b>
Availability of Instructional resources	2	50
Learner's academic ability	1	25
Students attitude towards Chemistry	1	25
Teacher's motivation	0	0
Total	4	100

All teachers did not agree that their motivation affected learners. Half of them that is, 50% responded that availability of instructional resources affected their students' performance in Chemistry. 25% responded that learners' ability affected the students' performance while the other 25% responded that it is students' attitude towards the subject that affected performance in Chemistry. Considering that 75% of the schools had 0-1 chemistry reference books, this suggests that presence of textbooks for Chemistry is very important.

#### 4.9 Teacher motivation and performance of Chemistry

Teachers were asked to indicate the factors that affected their motivation and how they affected the Students' performance in Chemistry. The findings are presented in the Table 4.15 below.

**Table 4:15: Effect of teacher motivation on the performance in Chemistry**

<b>FACTORS</b>	<b>Frequency</b>	<b>Percentage (%)</b>
Monetary benefits	0	0
Fringe benefits	0	0
Availability of Instructional resources	1	25
None of the above	3	75
Total	4	100

75% of the teachers responded that monetary benefits, fringe benefits and availability of instructional resources did not affect their motivation. However, 25% responded that availability of instructional resources affects their motivation which in turn affects the performance in Chemistry.

#### **4.10 Rating of Students' performance in Chemistry**

Teachers were asked to rate the performance of their students in Chemistry. The findings were summarized in the Table 4.16.

**Table 4.16: Rating of students' performance in Chemistry**

<b>Performance of Chemistry</b>	<b>Frequency</b>	<b>Percentage (%)</b>
Good	1	25
Fair	3	75
Poor	0	0
Total	4	100

75% rated performance in Chemistry as fair while 25% rated it as good. Most teachers therefore thought that the results could have been better.

#### 4.12 Professional qualification of staff

Teachers were asked to state their academic qualifications and this was recorded and presented in form of tables.

##### 4.12.1 Head teachers

Head teachers were asked to indicate their professional qualifications. The findings were presented in the Table 4.17.

**Table 4.17: Head teacher's qualification**

Professional qualification	Frequency	Percentage (%)
Diploma	0	0
B.Sc.	0	0
B. Education/PGDE	3	75
Postgraduate (Masters/Doctorate)	1	25
Total	4	100

75% of teachers rated trained with a Bachelors of Education degree or postgraduate in diploma education while 25% had a Master's degree. None of the head teachers had a Diploma or a Bachelor's degree in Science.

##### 4.12.2 Chemistry Teachers

Teachers were asked to indicate their professional qualification. The results were analyzed in Tables 4.18.

**Table 4.18: Chemistry teacher's professional qualification**

Professional qualification	Frequency	Percentage (%)
Diploma	0	0
B.Sc.	0	0
B. Education/PGDE	3	75
Postgraduate(Masters/Doctorate)	1	25
Total	4	100

75% of teachers rated trained with bachelors of education degree or postgraduate in diploma education while 25% had a diploma.

#### 4.13 Chi-Square Tests

Chi-square tests were performed to find out the influence of independent variables on Chemistry performance in KCSE among learners in public secondary schools in Mukaa Sub County. Findings in Table 4.15 show that student's attitude ( $p=0.000$ ) and teaching resources ( $p=0.021$ ) were significant. Cramer's V values showed that student's attitude ( $v=0.680$ ) had a greater influence than teaching resources ( $v=0.305$ ). The v values were calculated using the formula;

$$V = \sqrt{\frac{r-1}{c-1}}$$

**Table 4.19.**

#### Chi-square Output

Variable	Significance (p-value)	Cramer's V
Students attitude	0.000***	0.680
Teacher motivation	0.068	
Teaching resources	0.021***	0.305
Teacher preparedness	0.104	

\*\*\* Significant at 95% confidence level

#### **4.9.1 Student's Attitude and Performance in Chemistry**

The attitude of students in public secondary schools in Mukaa sub-county was assessed together with how it influenced their Chemistry performance. A significant attitude ( $p=0.000$ ) was noted as shown in table 4.16. The findings of the study targeting public secondary school learners in Mukaa Sub -county therefore show a slight association between the attitude and Chemistry performance of students. The culture of failing in the subject of Chemistry is a reflection of the student's negative attitude and phobia in relation to Chemistry in the area under study. The perception of failure in Chemistry exhibited by the students is attributed to a tradition of poor performance in the subject.

Ernest (2019) agrees by stating that Chemistry is publicly perceived as difficult, complicated, and conceptual and involves a lot of thinking. Manoah *et al.*, (2021) in support observed that the performance of students is often attributed to their attitude towards it. Those who perform well in the exam are often believed to have had a positive attitude. Some studies (Tezer & Karasel, 2020; Yilmaz *et al.*, 2020; Fan, Quek, Yan, Mei, Lionel & Yee, 2019) have however dispelled this by showing that Chemistry has been positively perceived by students.

#### **4.9.2 Teacher Motivation and Performance in Chemistry**

While targeting public secondary schools in Mukaa sub-county, the study looked at the student's Chemistry performance and how it was being impacted by the teacher motivation of their family. There was no significant ( $p=0.068$ ) impact that was observed by the teacher motivation. This means that the students in public secondary schools were not being significantly influenced by the teacher motivation. Thus no significant relationship was recorded between the two variables. It was observed that lack of finances and role models formed the teacher motivation of the students.

This however was not significant. The student's performance in Chemistry was therefore believed to be strongly influenced by other variables such as their attitude.

These findings depart from views held by Kagume (2020) and Mbugua (2019) who linked the teacher motivation on the students with their Chemistry performance. Robert and Taylor (2019) however found in their study at the New Hampshire that in public high schools, the average performance of students was strongly related to social and economic factors. Zahyah (2020) also presented different findings in a study based in Malaysia. It stated that the academic performance of children was determined by the level of education of both parents and the availability of reading materials in their homes. The aim of the study was to investigate the social and economic determinants of academic achievement of children. Further, Mohamed *et al.*, (2020) differed in view by stating that his study found that several social and economic determinants that surround the students can predict his/ her academic performance.

#### **4.9.3 Teaching and Learning Resources and Performance in Chemistry**

While the target was Mukaa sub-county and the sample being students in public secondary schools. The study sought to establish how their Chemistry performance was being influenced by the teacher and the resources used in learning. A statistical significant rate ( $p=0.021$ ) was observed on the resources used in teaching and learning. The study was therefore able to find an association between student's Chemistry performance in public secondary schools and the resources applied in teaching and learning in Mukaa Sub-county. The study attributed this finding to the Chemistry teachers inadequate preparation in teaching, inadequacy of material and equipment's that can be used in teaching Chemistry. The teaching resources are often used in motivating students when teaching Chemistry and eradicating the fear and negative perception of Chemistry in students.

It was also noted by Organization for Economic Co-operation and Development (OECD) (2019) that the performance of the student is lowered and affected by shortages in the teaching and learning resources. These findings are consistent with the findings by Akungu (2019) who found that school which experience lower learning outcomes from students are often lacking the basic resources both physical and material. The finding is also in tandem with Lyons (2019) finding that schools become enhanced and effective through the available TLR. This is because, these are essential resources that institute academic performance that is good for the students. The finding is also in tandem with findings of Johan (2020), Momoh (2020) and Lyons (2022) who also found high inadequacy of teaching resources.

#### **4.9.4 Teachers' Preparedness and Performance in Chemistry**

To evaluate the effects of teachers' preparedness and workload on Chemistry performance in KCSE among learners in public secondary schools in Mukaa sub-county. The findings show that teachers preparedness and workload ( $p=0.104$ ) was not significant. This means that there was no significant relationship between teacher's preparedness and workload and performance in Chemistry among learners in public secondary schools in Mukaa sub-county. Although there was widespread poor preparedness of teachers in Chemistry brought about by heavy workload, well prepared teachers would not have made a difference due to inadequacy of resources and students' negative attitudes towards Chemistry. This is therefore in contrast to findings of Nye, Konstantopoulos and Hedges (2019); Jackson (2022); Chetty *et al.*, (2019) and Gichuru and Ongus (2019) which stated that a high number of students with high performance was being produced by teachers who applied their teaching practices in an effective manner as opposed to those who ineffectively practiced.

## CHAPTER FIVE

### SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

#### 5.1 Introduction

This chapter presents the summary of the findings of the study. The conclusions and recommendations are also presented. In Mukaa sub-county, very few students attained the required grade of C+ in the subject between 2022 and 2019 which is the minimum grade required to pursue a degree course in local universities. The implication of the poor performance in Chemistry in the sub county (D-) means that majority of students dream for tertiary education has been jeopardized by poor performance in Chemistry. This study focused on assessing how student attitude, teacher motivation, adequacy of teaching and learning resources and teachers' preparedness, and workload influence Chemistry performance in KCSE among learners in public secondary schools in Mukaa Sub-County.

A descriptive study design was adopted. The focused of head teachers, tutors teaching Chemistry, and Form three learners within public secondary schools in the sub-county of Mukaa since they could easily relate to the trends in performance in Chemistry in their schools and have easy access to the required data. Sampling was done at multiple stages to arrive at a representative sample of 48 respondents. Questionnaires were used for data collection from Chemistry tutors and learners. Interview schedule was utilized to acquire data from head teachers. An observation checklist was used to collect data on teaching resources.

Descriptive statistics was utilized in the analysis of data with the support of Statistical Package for Social Sciences. Chi-square tests were used to establish relationships. The findings were presented in form of tables.

## **5.2 Summary**

### **5.2.1 Teaching methods**

Teachers prefer demonstration method compared to practicals despite the presence of equipped laboratories. The students therefore are not well versed with the practical dimension of Chemistry. This led to most of them saying that the practicals make Chemistry a difficult subject.

### **5.2.2 Adequacy of instructional resources**

Schools have a library which is not well equipped. The available texts however are relevant and student to book ratio is adequate the laboratory is well equipped but teachers prefer the demonstration method. Lack of the hands-on approach has led to students perceiving the subject as difficult due to the presence of practicals. Therefore, there is underutilization of the resources.

### **5.2.3 Motivation of the teacher**

Majority of the teachers responded that they were not motivated by money, fringe benefits and availability of instructional resources. 25% noted that availability of instructional resources was a motivating factor for them. When asked about the factors that affected performance of Chemistry in their schools, teachers, a majority responded that availability of instructional materials was key, followed by learners academic ability and student attitude towards the subject. None commented that teachers' motivation affected performance. Therefore, from the study, teacher motivation does not affect the performance of the students in Chemistry.

#### **5.2.4 Attitude of the learner**

Most students did not respond positively to questions that investigated their attitude towards Chemistry. Teachers neither were not better as 75% of them responded that it was below average too. The students have a negative attitude towards Chemistry despite the fact that they are interested in careers that need the knowledge of Chemistry. Students' attitude towards the subject has affected the performance in the subject.

In addition, the findings indicated that there are three influences of the attitude of students towards chemistry: The first indicator is the students' Motivations were found to influence their attitudes towards chemistry. The study found that students who liked chemistry and were highly motivated in performing its tasks performed well, unlike their counterparts who were demotivated. They agreed that chemistry was widely applicable and useful in their future careers. Majority did not perceive chemistry as a difficult subject and could not fail to pursue it even if it was optional. Hence motivation is among the strongest predictor variables affecting students' achievement in Chemistry.

The second influencing indicator of the students' attitude towards chemistry is the learning ability and competence in chemistry as a subject. Although the students agreed that learning chemistry involved a lot of memorizations of facts and formulae which were difficult to grasp, they confessed they could get good grades after working hard. The learning abilities and positive minds of the students enabled them to view the subject as something learnable, achievable and were related to most of the environmental activities. The efforts and their competencies affected their attitudes towards chemistry as the students felt that not everyone can be good in all subjects.

The third indicator which affects students' attitude in chemistry is the previous performance and rankings in chemistry. The study found that chemistry was the least performed subject in schools and this had given students a dull perception that it was normal to fail in chemistry. This creates a myth that chemistry is a subject which is normally scored poorly. This shows that previous performance in chemistry negatively affected the students' attitude towards chemistry.

It is the conclusion of this study that perception of the students affects Chemistry performance in KCSE among students in public secondary schools within the sub county of Mukaa. Particularly, the learners have poor attitude regarding the Chemistry field hence it has negatively influenced their achievement in Chemistry. The students see it as a hard complex subject that is hard to grasp and as such majority of students have lost interest and are resigned to the fact that they will fail in it.

The study concludes that students' family teacher motivation has little or no influence on Chemistry performance in KCSE among learners in public secondary schools in Mukaa sub-county. This is because although majority of students come from poor families and a culture of failing in the subject, there are overriding factors which have a stronger influence such as students' attitude.

The study concludes that teaching resources influence Chemistry performance in KCSE among learners in public secondary schools in Mukaa sub-county. Specifically, the lack of adequate resources for teaching Chemistry that negatively affects performance in the subject. Resources such as geometric equipment, modern teaching aids and Chemistry textbooks had a low adequacy. Limited resources such as lack of adequate Chemistry books brings difficulty in teaching and learning Chemistry.

The study also concludes that teacher preparedness has little or no influence on Chemistry performance in KCSE among learners in public secondary schools in Mukaa sub-county. Although teachers' preparedness was not optimal, having good preparedness would not raise the Chemistry performance due to underlying factors namely students' pessimistic perception and insufficient teaching and learning resources.

## **5.4 Recommendations**

This section provides recommendations for policy, practice and research.

### **5.4.1 Recommendation on Research Findings**

The survey proposes that in the sub-county of Mukaa, public secondary school procure the services of motivational speakers for purposes of swaying the learners towards Chemistry. The schools should also visit other schools in other counties in order to benchmark with them and their learners can visit and be enlightened.

There is need for parents to support their children in learning Chemistry this should be emphasized in parents and teachers' meetings. In accordance with the study, the education ministry should commit more resources to schools especially teaching resources for Chemistry. More teachers should also be employed to ease the workload on the existing staff.

The study also recommends use of audio-visual equipment and internet based programs to teach Chemistry. There should be indoor and outdoor Chemistry laboratories, field trips, industrial visits and market research.

#### **5.4.2 Recommendations for Further Research**

In this study, only teaching resources and teacher preparedness were studied. Future studies should also investigate teachers' competence and teaching methods. In addition, the challenges and opportunities in the Chemistry curriculum should be looked into keenly. A wider study comprising of more public secondary schools should be conducted to enhance our understanding on determinants that influence the achievement of Chemistry in KCSE among learners in public secondary schools.

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## APPENDIXES

### Appendix I: Letter of transmittal



P.O.BOX 90-90128

TEL: 0790-4440000

MTITO ANDEI

: 0791-444000

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OFFICE OF THE DIRECTOR

(BOARD OF POST GRADUATE STUDIES)

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19/09/2023

TO WHO IT MAY CONCERN

**RE: JENIFER MUINDE- MED/01/4054/SBA/2022**

The above student is undertaking Masters of Education at Lukenya University. She has completed her Proposal writing on Topic “**Factors Influencing Students’ KCSE Academic Performance in Chemistry in Public Secondary Schools in Mukaa Sub-County, Makueni County**” under her supervisors;

- **Dr Winfred Kaleli -PhD**
- **Dr Charles Mwambela -PhD**

Any assistance given to her in collecting data from the relevant office is highly commendable

Sincerely Yours.

**PROF. IMTEYAZ AHMAD**

**Director Board of Post Graduate**

## APPENDIX 2: INTERVIEW SCHEDULE FOR HEAD TEACHERS

The purpose of this interview is collect data on factors that influence performance in Chemistry among learners in public secondary schools. Please respond to the questions to the best of your ability.

1. How would you describe students' attitude towards Chemistry?

.....  
.....  
.....

2. Do you think the students' family teacher motivation influences their performance?

- Yes
- No

Explain your answer

.....  
.....  
.....

3. How would you rate the availability and Chemistry teaching resources?

- Very high
- High
- Fair
- Low
- Very low

4. How would you describe teacher preparedness in teaching Chemistry?

.....  
.....  
.....

5. What strategies has the school adopted to enhance performance of Chemistry?

.....  
.....

.....

### APPENDIX III: QUESTIONNAIRE FOR TEACHERS

Please respond to the following by ticking in the space provided on the question applicable to you. To maintain anonymity, do not indicate your name. Thank you.

#### SECTION A: GENERAL INFORMATION

1. What is your gender?

- Male
- Female

2. How old are you?

- 21-30 years
- 31-40 years
- 41-50 years
- Over 50 years

3. What is your highest level of education?

- Diploma
- Bachelor's degree
- Post graduate degree

4. How long have you taught Chemistry?

- <5 years
- 6- 10 years
- 11-15 years
- >16 years

#### SECTION B: STUDENTS ATTITUDE TOWARDS CHEMISTRY SUBJECT

5. The purpose of this question is to assess students attitude and confidence in Chemistry which can have an influence on performance. Kindly respond to each statement using the answers ranging from “strongly agree” to “strongly disagree” using the scale below:

5= Strongly Agree, 4=Agree, 3=Neutral, 2= Disagree, while 1=Strongly Disagree.

Study methods	5	4	3	2	1
Students generally like Chemistry and believe they will get good grades					

Chemistry usually makes students feel uncomfortable and nervous during Chemistry lessons and test leading to poor performance					
Chemistry teachers have built confidence of their students on their ability to pass well in KCSE					
Self- efficacy: Many students feel they have no ability or talent to succeed in Chemistry.					
Learning Chemistry involves a lot of memorization of formula which are difficult to grasp and Many times miss Chemistry lessons because the subject is difficult					
Chemistry is too complex and It is difficult to pass Chemistry it in KCSE especially in this school. It is normal that majority of students fail in the subject					
Students attitude towards Chemistry greatly influences their performance on the subject					

### SECTION C: TEACHER MOTIVATION

6. Kindly respond to each statement using the answers ranging from “strongly agree” to “strongly disagree” using the scale below:

5= Strongly Agree, 4=Agree, 3=Neutral, 2= Disagree, while 1=Strongly Disagree.

<b>Statement</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>
Low pay demotivates tutors					
Work environment demotivate the tutors					
School culture demotivate the tutors					

### SECTION D: TEACHING AND LEARNING RESOURCES

7. Kindly respond to each statement using the answers ranging from “strongly agree” to “strongly disagree” using the scale below:

5= Strongly Agree, 4=Agree, 3=Neutral, 2= Disagree, while 1=Strongly Disagree.

Statement	5	4	3	2	1
Inadequacy of textbooks, revision materials and Limited access to library materials hinders effective teaching and learning of Chemistry					
There is a friendly and cooperative relationship between Chemistry teachers and the students which makes the subject enjoyable					
The school has adequate infrastructure (Classes, desks, library) and Chemistry teachers have adequate workspace for preparation, collaboration or meeting with students					
Teaching method in Chemistry is student centered and participatory which have enhanced student understanding on complex Chemistry concepts					
Availability and effective utilization of teaching and Instructional materials have a great potential of improving performance in Chemistry in KCSE					

### SECTION E: TEACHER PREPAREDNESS

8. Kindly respond to each statement using the answers ranging from “strongly agree” to “strongly disagree” using the scale below:

5= Strongly Agree, 4=Agree, 3=Neutral, 2= Disagree, while 1=Strongly Disagree.

Statement	5	4	3	2	1
Chemistry teachers have adequate time to Prepare lesson plans					
Chemistry Teachers-student ratio is high, making it impossible for the teacher to interact with students at a personal level					
Chemistry teachers and students are rewarded whenever improvement in performance is noted to appreciate them and maintain morale					
Inadequate preparation lack of motivation to both teachers and students and high teacher workload have contributed to dismal performance in Chemistry subject					

**SECTION F: PERFORMANCE IN CHEMISTRY IN KCSE**

9. Kindly provide a summary of performance in Chemistry for the last 5 years

Year	KCSE School mean score
2019	
2020	
2021	
2022	
2023	

**~Thank you for your participation~**

## APPENDIX IV: QUESTIONNAIRE FOR STUDENTS

Please respond to the following by ticking in the space provided on the question applicable to you. Do not indicate your name. Thank you.

### SECTION A: ATTITUDE TOWARDS CHEMISTRY

1. Kindly respond to each statement using the answers ranging from “strongly agree” to “strongly disagree” using the scale below:

5= Strongly Agree, 4=Agree, 3=Neutral, 2= Disagree, while 1=Strongly Disagree.

STATEMENT	5	4	3	2	1
Chemistry is too complex and It is difficult to pass					
Chemistry doesn't scare me at all and I believe I will get good grades					
Chemistry usually makes me feel uncomfortable and I am nervous during Chemistry lessons and test					
I have confidence in tackling Chemistry related problems					
I have no ability or talent to succeed in Chemistry					
Chemistry teachers have made me feel I have the ability to pass well in Chemistry					
Chemistry is a worthwhile and necessary subject					
Chemistry is of no relevance to me and I expect to have little use for it when I get out of high school					

### SECTION B: TEACHER MOTIVATION

2. Kindly respond to each statement using the answers ranging from “strongly agree” to “strongly disagree” using the scale below:

5= Strongly Agree, 4=Agree, 3=Neutral, 2= Disagree, while 1=Strongly Disagree.



Statement	5	4	3	2	1
Low pay demotivates tutors					
Work environment demotivate the tutors					
School culture demotivate the tutors					

~Thank you for your participation~

## APPENDIX V: OBSERVATION CHEKLIST

Item	Availability (1 = Yes, 2=-No)	Condition (1= Good, 2- Fair, 3= Poor )	Adequacy (1=high, 2= fair, 3= low)
Chemistry textbooks			
Modern teaching aids			
Calculators			
Chemistry reference books			
Chemistry posters and charts			
Geometric equipment			
Computers with Chemistry related programs			

# APPENDIX VI: NACOSTI LETTER

 REPUBLIC OF KENYA	 NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION
Ref No: 128173	Date of Issue: 19/October/2023
<b>RESEARCH LICENSE</b>	
	
<p>This is to Certify that Ms. JENIFFER ndini MUINDE of LUKENYA UNIVERSITY, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Makueni on the topic: <b>EFFECT OF STUDENTS' ATTITUDE ON PERFORMANCE IN CHEMISTRY IN SECONDARY SCHOOLS IN MUKAA SUB-COUNTY, MAKUENI COUNTY KENYA.</b> for the period ending : 19/October/2024.</p>	
License No: NACOSTI/P/23/30530	
128173 Applicant Identification Number	 Director General NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION
	Verification QR Code
	
<p>NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.</p>	
See overleaf for conditions	

**APPENDIX ((VII): Letter of Introduction**

**JENIFFER NDINI MUINDE,  
LUKENYA UNIVERSITY,  
P.O BOX 90-90128,  
MTITO ANDEI.**

**Dear Respondent,**

**RE: REQUEST FOR RESEARCH DATA**

I am a postgraduate student at Lukenya University, pursuing a mastes' degree in Educational Administration in the School of education and social sciences, Lukenya. Reg. No. MED/01/4054-SBA/2022.I intend to conduct a research study entitled, 'Effect of students' attitude on performance in chemistry in Public secondary schools in Mukaa sub-county, Makueni county Kenya'.

I kindly seek your permission to collect data from the respondent in the foresaid schools. The data will be collected using questionnaires. Any information collected will be treated with utmost confidentiality and will be used only for the intended purpose of the study.

Your assistance will be greatly appreciated.

Yours faithfully,

Jeniffer N Muinde.

**APPENDIX (VIII): The Timelines/Work Plan**

**The Timelines/Work Plan**

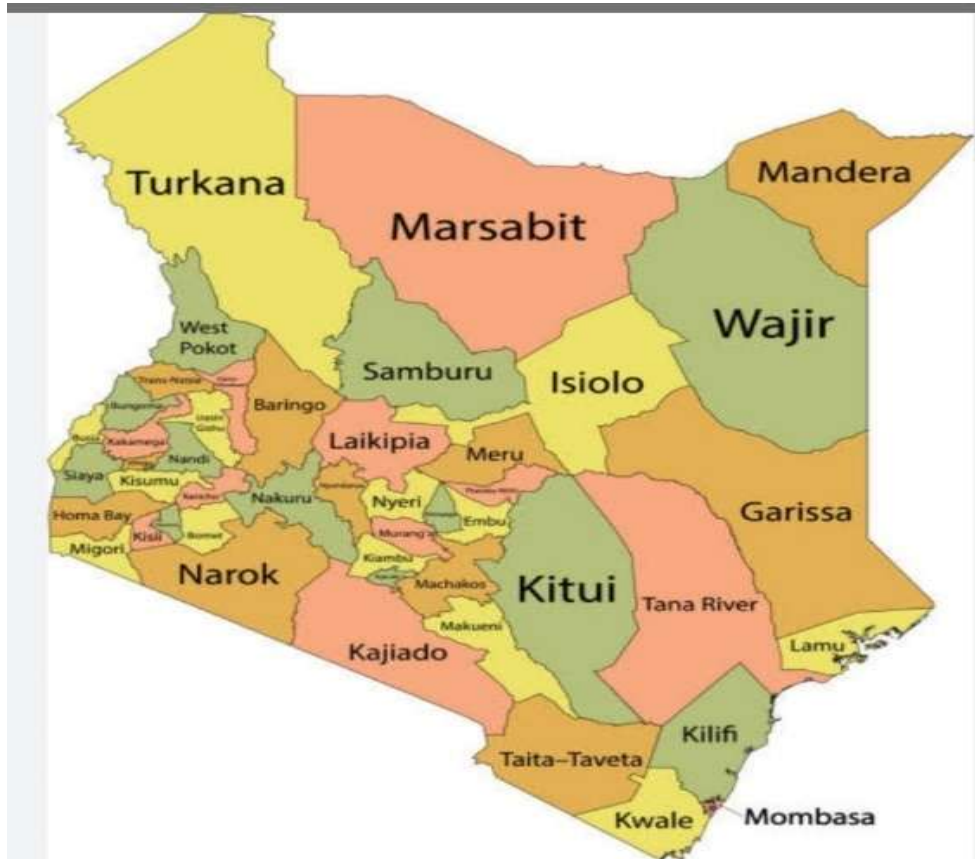
Activity and Time	April 2023 - May 2023	June 2023 July 2023	Mar 2024	Apr-May 2024	June 2024	August -Sept 2024	October 2024	November 2024
1 Concept paper writing								
2 Proposal writing and corrections by the supervisors								
3 Proposal approval by the graduate school								
4 Data collection entry and coding								
5 Data analysis and presentation								
6 Draft Report writing, revising and editing								
7 Project submission and review								
9 Graduation								

**APPENDIX (IX): The Research Budget**

<b>No.</b>	<b>Expenditure</b>	<b>Unit</b>	<b>Quantity</b>	<b>Unit in Kshs.</b>	<b>Total cost in Kshs.</b>
1.	Notebooks	Item	3	100	300
2.	Pencil and pens	Item	10	20	200
3.	Photocopying of proposals and questionnaires	volumes	10	500	5,000
4.	Foolscaps	Ream	3	400	1200
5.	Transport to fieldwork	Day	10	300	3,000
6.	Lunch during fieldwork	Day	10	300	3,000
7.	Draft proposal printing and binding	volumes	12	400	4,800
8.	Draft project report and binding	Page	10	500	5,000
9.	Airtime	frequency	40	100	4,000
10.	Final project printing and binding	volumes	9	800	7,200
11.	Transport to Lukenya University to report to school and supervisors	Days	5	2000	10,000
	<b>Total</b>				<b>43,700</b>

# MAPS

## 3.1 Map of Kenya



## 3.2 Map of Makueni



### 3.3 Map of Mukaa Subcounty

