

**EFFECTS OF GENDER ON STUDENTS' ACADEMIC PERFORMANCE
IN CHEMISTRY IN SECONDARY SCHOOLS: A CASE OF KITUI SOUTH
SUB-COUNTY, KITUI COUNTY, KENYA**

BY

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DECLARATION

This research project is my original work and has not been presented for similar or any other award to any other university.

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This research has been submitted for examination with my Approval as the university supervisor.

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DEDICATION

To my husband Mr. Stephen Muthoka Ngala thank you for your encouragement and financial support you accorded me and our son Goodluck Ryan.

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ABSTRACT

The study purposed to explore the relationship between effects of gender and performance of students in chemistry subject in secondary schools in Kenya. It investigated three aspects of gender and how each aspect affects performance of students in chemistry. These aspects included; society perception on gender and how it affects academic performance of students in chemistry, Second, family environment on gender and its effects chemistry performance by students in secondary schools in Kenya, third, student attitude towards chemistry and how this affects how they do in the subject in Kenyan secondary school. Quantitative research method and precisely correlational research design was employed. All secondary schools in Kitui South Sub-County were the target population. The sample size was 318 respondents which comprised 6 secondary schools principals, 12 chemistry teachers and 300 students. Questionnaires were the main instrument for the study. The questionnaires were categorized into three categories; one for the schools principals, second category for chemistry teachers and the third category for students. For establishment of any relationship between three gender aspects and academic performance in chemistry Pearson correlations were used. The results indicated that society had different perceptions on male and female, with male perceived superior to female. In addition they indicated that students had negative attitude towards chemistry. The correlational results analysis showed a negative correlation between society perceptions and students' attitude and performance in chemistry and positive correlation between family environment and performance. It was recommended that students be offered guidance and counseling to change their mindset concerning gender and to be given motivation to change their attitude to positive attitude towards chemistry. Suggestions made included replication of the study to other counties to improve generalization.

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Education is fundamental to the development of any country and most important, capacities for human resources to sustain economic growth and development. For this reason, any country that is planning on their development should make sure is achieved in most efficient and effective manner by providing equitable and quality education to its citizens. Africans had developed their own systems of education even before the coming of Arabs and Europeans to Africa and although the systems were different from one community to another, their goals were almost similar. Before colonization and even before the arrival of missionaries Africa had its own form of learning and training (Mosweunyane, 2013).

Men and women had different roles in the society of western world which continued unquestioned not until later in the twentieth century, (Busolo, 2010) state that the only progress that women had achieved by 1920 was the rights to vote and the general access to all levels of education. Nevertheless, the disguised disparity between genders in numerous fields of employment was not completely overcome, this can be evident by the fact that there are quite few female scientists and engineers. It is generally agreed that today, science, technology and innovation play a significant role in the realization of Sustainable Development Goal number 4 on qualitative basic education for both genders.

Chemistry is a vital subject in every life aspect. In Kenya, for selective advancement in education is among the key subjects considered (Busolo, 2010). Even though chemistry is such an important subject, its teaching and learning in secondary schools still faces challenges, the major one being negativity demonstrated by students, especially female students. They remark the subject as difficult and uninteresting.

Most people know and acknowledge the importance of chemistry, but its performance has remained poor over the years in the national examination. Also, gender disparity in performance does exist. Optimizing achievement as well as reducing performance disparity between male and female students may definitely bring greater economic efficiency within the system, when opportunities available for girls are increased gender differences can be reduced (Busolo, 2010). One way to reduce gender disparities in sciences and mathematics academic performance is do away with traditional and stereotypical approaches to problem solving. Dania (2014) stated that

because of the complex realities of our time these approaches are inadequate. Academic achievement refers to the teaching and learning outcome acquired by individual student and it is usually determined by an assessment.

According to Nnaman and Oyibe (2016) Gender is defined as a constructed phenomenon of ascribing different roles, duties, behavior and mannerisms to the two sexes by a society. It refers to specific cultural patterns of behavior ascribed to two human sexes and it has social implications as well (Nnaman and Oyibe, 2016). Parajuli and Thapa, (2017), defined gender as socially constructed differences between male and female. Traditionally, gender is used to outline how society give different roles to boys and girls (Igbo, 2015). Issues of gender can clearly be understood by studying gender theory. Gender theory and feminist theory are closely related as they both focus on the relationship between difference and inequality through theorization of gender role socialization (Jule, 2014).

People in the society identify themselves with certain attributes based on their gender that is either male or female and this affects children as they grow. Children are expected to behave in a certain manner based on society's perception on how particular gender should behave. Gender is the product of interpretive perceptions, it is how we perceive and how we are perceived. One of the Millennium Development Goals (MDGs) of the year 2000 was gender equality but not much had been attained by its target date of 2015. This goal is also one of the Sustainable Development Goals (SDGs) which carries on the momentum generated by the MDGs beyond 2015 and as country and continent we should implement this goal otherwise gender disparity will continue to be experienced in all sectors.

There are different factors that have been associated with poor performance in chemistry which include; increased number in school enrolment, inappropriate syllabus, bad attitude of the students towards the subject, insufficient resources and ineffective instructing methodologies (Orodho, 1996). Despite the ministry of education's efforts to curb the above causes, still students perform poorly in chemistry and gender differences in the performance are undeniable. This therefore implies that the problems that cause poor performance have not been adequately addressed.

1.2 Statement of the problem

Women continue to encounter problems as consumers and providers of education especially in sciences and mathematics compared to their male counterparts. Chemistry is an important subject and its study remains significant in every life aspect. In Kenya, chemistry is an important subject and it is required in science and technology advancement, it is therefore needed in most careers in the education system. The high failure percentage of learners, precisely in chemistry compared to other sciences remains to be a threat in Kenya. Although the subject is poorly performed generally, male students tend to perform better than their female counterparts. Some causes of poor performance in chemistry include inadequate teaching and learning resources and equipment, inadequate teacher training and remittent, prosaic curriculum and negativism of students, these were conclusions made from research conducted by Twoli, (1986) and Orodho, (1996). Much effort has been put in place to counter these factors, including advocating for gender equality by government and Non-governmental Organizations but still gender discrepancy in chemistry performance perseveres. This therefore shows that exhaustively tackling on the factual problem of effects of gender and poor academic performance in chemistry has not been made, there also seems to be a few researches that have been done in Kitui south sub-county, Kitui County, Kenya, therefore need for more research. There have also been controversial findings on those researches already carried out, some indicating that there is no correlation between the two aspects while others stating that there is correlation between the two aspects. Due to this gap and controversy, further probing on effects of gender on students' academic in chemistry is needed.

1.3 Significance of the study

The study may have practical connotation in that the students may identify areas that give them difficulties, especially those outdated societal stereotypes on gender that affect their full commitment in pursuing sciences and overcome them. The teachers on other hand may be sensitized on eliminating gender disparity in performance by embracing suggested approaches to improve students' performance in chemistry. Authors may also benefit in that they may be able to prepare both teaching and learning materials avoiding any gender prejudice that may affect student performance. The research may also provide great and reliable findings to the ministry of education to address the performance parity between male and female students.

1.4. Objectives of the study

The objectives of the study were:

1. To establish the correlation between society's gender perceptions and academic performance of students in chemistry in secondary schools in Kenya.
2. To establish correlation between family environment and students' academic performance in chemistry in secondary schools in Kenya
3. To establish the correlation between student attitude and their performance in chemistry in secondary schools in Kenya

1.5 Research questions

1. Does society perceptions on gender and students' academic performance in chemistry in secondary schools in Kenya have any relationship?
2. Does students' attitude and academic performance in chemistry in secondary schools in Kenya have any relationship?
3. Does family environment and academic performance of students have any correlation?

1.6 LIMITATIONS

Some limitations of this study include;

The outcome may perhaps not be descriptive of all schools in the whole country, since it's only from selected schools in Ikutha sub-county, Kitui County were the respondents were drawn from. Inadequate resources and stretch may hamper further extension of the research to the other counties.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The section brings out scientific inquiries that have been carried out related to the study in the listed segments. The chapter is organized into different sections which include: Gender concept, gender effects on students' academic performance, teachers' related barriers in chemistry performance and resources availability.

2.2 Gender concept

Numerous scholars have defined gender differently; Nnamani and Oyibe, (2016) defined gender as a socially fabricated roles, duties, behavior and mannerism which are acceptable to the two sexes. Lahey and Waldman (2003), defined gender simply as being a male or a female psychologically. Gender is more than just sex which is simply male and female based on biological traits, other characteristics such as, orientation and identity based on individual perception of self are included in the gender aspect. In addition Betiku (2002) defined gender as societal determination of characteristic of each sex either male or female. Avulata and Oniyama (1999) defined gender stereotypes as "hidden curriculum" that influences girls conformity expected role by society. In most societies, gender issues have been used to oppress women folk, these practices prevent or limit the female gender in effectively participating in development as well as from the development efforts benefits (UNESCO, 2000). Female students are battling psychological depression caused by this oppression (Joel and Aride, 2006). Joel and Aride adds that the psychological effect has forced many female students to unknowingly run away from science subjects, such as Chemistry, biology and physics. Most of them take those which are compulsory in their school but not because they like them. It has been noted that many female students like and do very well in languages and arts subjects compared to male students. In addition it has been argued that male students do well in sciences and mathematics which is a misleading perception, both genders have equal capacity if they focus and shake off the gender based ideologies in subjects in schools.

Gender issue is a very influential factor in human behavior and as it has been seen in different researches on attitude and behavior, gender issues have strong effects on academic achievement amongst males and females students (Block, 2006).

2.3 Gender effects on academic performance of students

The following are some effects of gender on students' academic performance:

2.3.1 Society perception

Conventionally, society encourages girls to conform while expecting boys to be dominant risk takers and active. Also in society what is regarded as complex and difficulty is assigned to boys while less demanding tasks are given to girls, this has created perception that girls are weaker sex and they grow up with these stereotypes which affect their personality. In school, some subjects are branded masculine like mathematics and sciences while others are branded feminine like languages (Francis, 2000). This can explain why boys do better in sciences than girls since they join schools with this mentality.

Researchers from various parts of the world have come up with controversial findings with some indicating that there no existence of any relationship between gender and academic achievement while others stating that there exist relationship among the two. Those with significance difference also are contradicting with some stating that male students perform better than female students while others stating vice versa. This clearly show that society's perception on gender affects students' academic performance.

Parajuli and Thapa (2017) in their research found out female students seemed to outperform their male counterparts in Nepal. Adigun et al (2015) found out there is no significance difference in student achievement in respect to gender in their study on effects of gender in students' academic performance in computer science in secondary schools in New Bussa, Nigeria.

Kisigot et al (2021), in their study on student achievement and gender effects discovered that boy gender performed better than girl gender, they associated this to cultural practices like house chores and teen pregnancies. They found out that cultural practices and unequal opportunities provisions in the learning environment disadvantages girls more compared to boys. Their findings were in agreement with Omenga and Nasongo (2010) who discovered that although there was no significance gender difference between girls' and boys' performance, boys had slightly higher mean scores compared to girls and they attributed this to girls been frequently engaged in domestic chores compared to boys.

2.3.2 Students' attitude towards chemistry

Adudu and Cbadamose (2014) define an attitude as like or dislike on something by an individual which is based on certain state of affair. Attitude is a comparatively durable association of opinions, emotions and behaviors towards objects, groups or symbols (Veresova and Mala, 2016). When it comes to education, Anghelache (2012) found out that how students perceived or their mentality towards learning/studying affected their school achievement.

Munguti (1984) views attitude as a person's state of mental inclination which is systematized by experience upon the individual responses as a result of exerting a directive or dynamic influence to all objects and related situations. Poor performance in chemistry by students could therefore being explained by their attitude towards the subject because they perceive it as hard . Mackatiani and mackatiani (2020) on their study on academic performance in Science: implication of gender parity in Kenyan secondary school concluded that attitude influences academic performance of students in sciences.

There is also socio-cultural influence in student attitude that difficult tasks have been traditionally associated with male. Females are linked with less demanding tasks like household chores. This has resulted in poor performance of female students in sciences which are believed to be hard, especially chemistry which is viewed by many students as very challenging.

2.3.3 Family environment

Academic performance of any student and family environment are inseparable. This is because learning starts from home even before the child joins any formal institution of learning. Some of family environment factors which influence child academic achievement include; parent level of education, parent occupation, number of sibling, emotional support and social-economic status of parents

Level of education attainment determines their exposure and influences their reasoning and behavior toward issues of life. This means that the parent level of education determines their exposure and kind of support and advice they offer to their children hence affecting their performance in school. Level of education of parents also determines all the factors like the occupation, social-economic status, number of children and emotional support they give to their children. For example, Occupation of a parent will determine the social economic status of the family, this will again determine the kind of school their children attend and also the learning

materials that the child can afford to support his/her learning in school. This directly will determine the academic performance of that child.

Khan et al (2019) revealed that family interaction and student' academic performance are significantly correlated. Jain and Mohta (2019) study revealed that child background and his/her academic performance are correlated. Alordiah et al (2015) showed that high socio-economic status families students performed better than students from low socio-economic status family, he attributed this to effects socio-economic status have on child school education like encouragement in studies, interest development in studies and career aspiration. Mackatiani and Mackatiani (2020) also revealed that socio-economic status of parent influence learner involvement in academic

2.3.4 Career aspiration

Career is a major concern for young people in any nation and making a right career choice is also a major concern for young people (Alberts et al 2003). The influence on career choice is complex and it should be noted that choosing a career is a developmental process rather than static. Student career aspiration influences the choice of subjects he/she is going to take resulting in his or her career in life. The student career aspiration not only influences the subjects to pursue in school but also the performance in those subjects.

Also, student choice of subjects can be swayed by parents and teachers guidance. Okeke (2000) revealed that students' career and subjects' choices are significantly affected by their parents. If we therefore want to an encouragement to students concerning chemistry, then we must show and talk to them about how science related careers are important and interesting.

Those students who are passionate about chemistry related careers tend to perform well in chemistry because they have passion for the subject and are determined and do whatever it takes for them to get good grades for the sake of their career aspirations. Those on the other hand are not interested in any career related to chemistry, take it for granted and tend to perform poorly in chemistry.

2.4 Teachers related barriers in chemistry performance

The following teachers' related factors have been found to affect students' academic performance in chemistry;

2.4.1 Attitude and motivation of the teachers

Despite science teachers having a positive attitude, their effectiveness and efficiencies in teaching is frustrated by problems they face (Mwangi, 2008). When results of chemistry especially in the

national examination are not good compared with other subjects, it frustrates and demotivates teachers who have put a lot of effort in teaching and preparing their students.

Other factors such as poor working environment and lots of work, for example there may be two chemistry teachers for a whole school; this means the teachers are overworked and they have no time for sufficient preparation. These may affect the attitude and motivation of teachers' hence affecting overall academic performance of the subject.

As a teacher when dealing with a student who has a negative attitude towards a subject, your attitude should serve as a reinforcement for the student's attitude toward chemistry. The teacher should also be gender sensitive so that some students would not be offended and affect their performance. Teachers who are supportive to students and set clear behavior expectations creates an enabling atmosphere where the learners have confidence in their future education success ability. (Akey, 2006),

2.4.2 Competency and instructional style

According to Oduol (2016), teacher's competence and student's performance in any subject are significantly related. That is; teacher's competency and the instructional approach used by a teacher contributes greatly to the student's performance in chemistry and all other subjects. The objectives of high quality education can only be attained by having competent teachers in the school.

The professional qualification for a competent teachers are; subject matter mastery, sense of organization, capability of ideas clarification in the subject, students' motivation ability for better performance, engagement of students in meaningful discussion in class, good management of learning materials and frequent students' progress monitoring through means such as; tests and examinations (Ajayi, 2009).

The instructional style of the teacher also affects the performance of students. The instructional styles should be based on the individual needs of each student since students are different in many aspects. If a teacher chooses teaching styles without considering individual differences, then some students may be left out. The method should be in such a way that it is effective for an average student.

2.5 Resource availability

Resource availability affects students' performance in any subject. Chemistry students cannot perform well if they do not have enough and right textbooks as well as an equipped laboratory.

Chemistry as a subject requires some practical sessions, hence if laboratory equipment and chemicals are not available there will be no practical sessions and this results in poor performance to chemistry students.

Ambogo (2012), found that resources availability such as textbooks, laboratory chemicals and equipment had higher and better performance in chemistry compared to schools which did not have sufficient resources. That means resources availability such as, textbooks and well equipped laboratories for chemistry practicals has influence on school performance in chemistry,

2.6 CONCEPTUAL FRAMEWORK

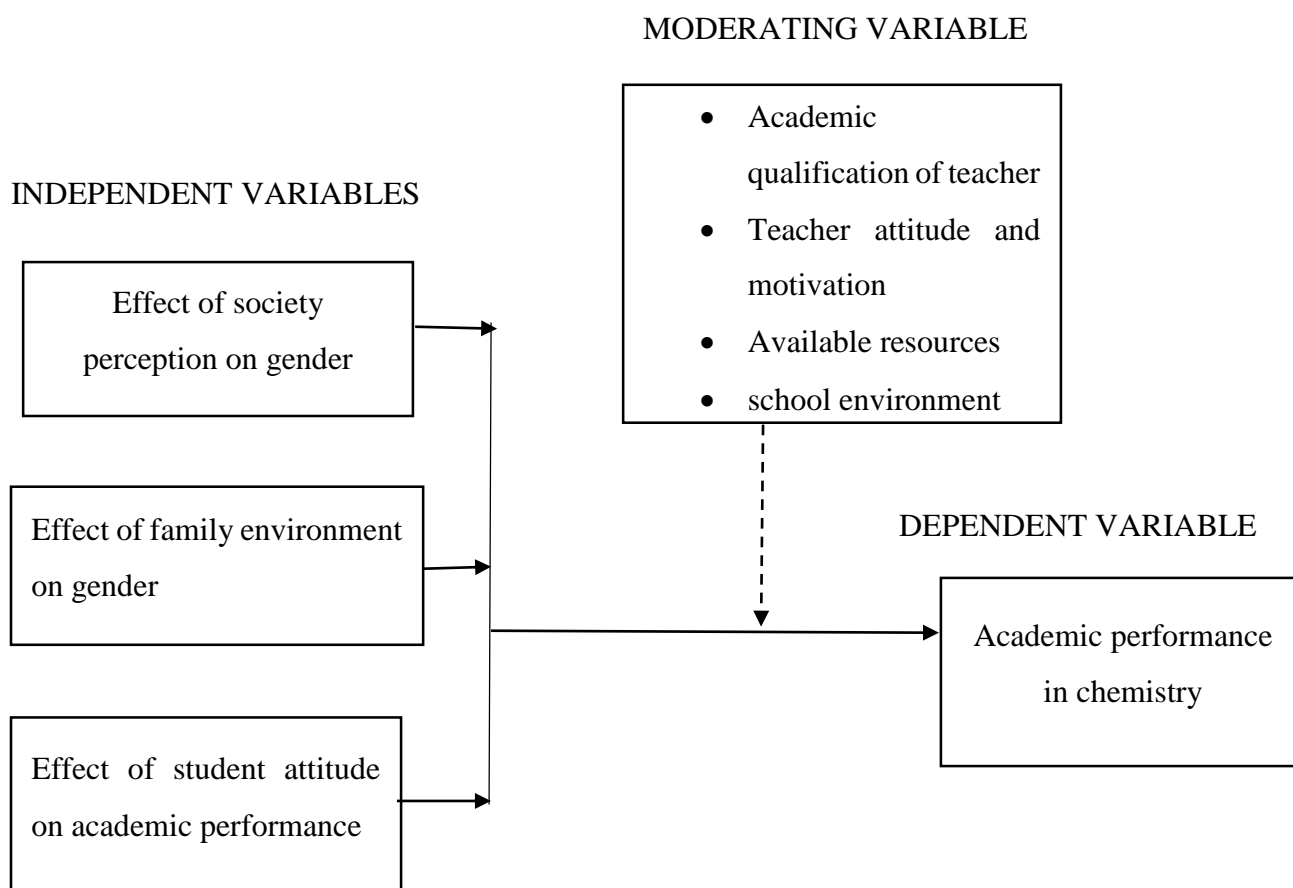


Figure 1 Relationship between effects of gender on chemistry achievement in secondary schools in Kenya

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

The section comprises of; design of research, population target, Sample, research tools, gathering of the data and analysis procedures and data collection ethical issues.

3.2 Design of research

Correlational design which is a form of quantitative research was used because the aim of the study was to establish the relationship on effects of gender and students' academic achievement in chemistry in secondary schools. This design focused on examining the association or relationship of variables. It also measured variables degree of association.

3.3 Target population

All secondary schools in Kitui South Sub-County were the target population for this study. Kitui south sub-county has 25 secondary schools. The target population was all 25 principals of the school, all chemistry teachers and all students taking chemistry.

3.4 Sample

The following sampling procedures were employed.

3.4.1 Sample description

The form four students were the primary source of information from the randomly selected secondary schools in Kitui South sub-county. Reason behind this being these students are adequately exposed to the chemistry syllabus. Form one and two are yet to be fully exposed and form three have just made their decision on subjects selection and their attitude and aspiration may change with time so their feedback may not be very reliable. Two chemistry teachers from each school were randomly selected, one male and one female were school had both gender teachers. Some schools did not have female chemistry teachers, in such schools all the selected teachers were male.

3.4.2 School types

To increase the efficiency of the population estimated and to guarantee desired representation of relevant subgroups stratified random sampling was used (Gay, 1992)

3.4.3 Individual schools

Schools were selected according to their type using stratified sampling. Gender differences in student achievement may vary occasioned by school type, therefore the type of school was a key consideration.

The schools were as follows;

Girls' school

Boys' school

Mixed school

Further the schools were categorized according to the school previous KCSE performance as either good performing if attained mean grade of D⁺ and beyond and as poor performing if attained mean grade of D and below.

Criteria which was used for selecting teachers was that the teacher should have been professionally trained and teaching a form four class.

Criteria for selecting students was that all the names of each student were put down on a small piece of paper, rolled and placed on top of the table. Based on the number of students required for the study, papers were pick randomly from the table.

3.4.4 Sample size

Kitui South has 25 secondary schools, 25% was used to constitute a sample for this study. Thus 6 schools were selected.

Table 3. 1 Number of schools

Performance criteria of schools	Type of school			Total
	Boys	Girls	mixed	
Good performing	1	1	1	3
Poor performing	1	1	1	3
Total	2	2	2	6

Table 3. 2 Number of principals, chemistry teachers and students

Type of school	Number of schools	Number of principals	Number of chemistry teachers	Number of students
Boys'	2	2	4	100
Girls'	2	2	4	100
Mixed	2	2	4	100
Total	6	6	12	300

Each school has one principal so number of principals was 6, two chemistry teachers were selected per school, so number of teachers was $6 \times 2 = 12$ teachers. 50 students were selected per school so the total number of student was $50 \times 6 = 300$

3.5 Data Collection Tools

For the objectives of the study to be achieved, descriptive survey employing correlation methods were used. Cohen and Manion (2016) stated that one or more instruments of data collection is involved in data collection in survey methods. Questionnaires were the main instrument for this study this is because they allowed anonymity of respondents. Three set of questionnaires were employed; one for principals, second one for chemistry teachers and the third set for chemistry students. The questionnaire were used to gather information concerning society perceptions and beliefs toward boys and girls that affect their academic performance, parents' role in influencing students' academic performance, students' attitude toward chemistry and effects of their attitude towards chemistry performance.

Semi-structured interviews

Semi- structured qualitative interview for principals and chemistry teachers gathered more data on more intangible aspects of effects of gender and chemistry performance for example values, assumption and beliefs. The interview was semi-structured

Documentary data

Documentary analysis and stored data were examined for what they included.

3.6 Data collection

Data collection proceeded in this sequence; first, administration of the questionnaire, which was followed by analysis of data obtained from questionnaires to provide materials for interviews. Then the interviews were conducted concurrently. Then lastly, the documented data was obtained.

3.8 Data analysis

After data was obtained it was organized first to make it meaningful. Then, numerical data was analyzed using SPSS.

3.9 Ethical considerations

Confidentiality of opinions was observed as well as observation of all set regulation in the country for research. Authorization to carry out the study from all the schools was obtained first before the questionnaires were issued. The information acquired was used exclusively for the research purpose only and privacy of respondents was highly observed. The respondents consent was sought first before they participated in the study and they were also briefed the purpose of the study for their cooperation. The filing of the questionnaires was a voluntary exercise and there was no coercion whatsoever on the respondents.

CHAPTER FOUR

DATA ANALYSIS PRESENTATION AND INTERPRETATION

4.1 Introduction

Data analysis, presentation and interpretation will be the main focus of this chapter. This will be based on the study objectives where the data collected is interpreted and discussed into details. This chapter comprises; instrument return rates, background data of the respondents and the answers to the objectives.

4.2 Instrument return rate

There were 318 questionnaires which were distributed, specifically 6 questionnaires for principals, 12 for chemistry teachers and 300 for students. The return rate was 100% as all respondents dully completed them and returned. This return was adequate for credible outcome of the study.

Table 4. 1 Return rate

Respondents' category	Sample size	Return rate	Percentage(%)
Principals	6	6	100
Chemistry teachers	12	12	100
Students	300	300	100
Total	318	318	100

4.3 Respondents' demographic data

The background data of the respondents was analyzed. The analyzed data include respondents' gender, years of experience for teachers and years of administration in the current school for principals.

4.3.1 Gender

All participants' gender was analyzed and summarized as shown.

Table 4. 2 Respondents' gender

	principals		Chemistry Teachers		students	
	N	%	N	%	N	%
Male	4	66.7	9	75	150	50

Female	2	33.3	3	25	150	50
Total	6	100	12	100	300	100

As indicated in the Table 4.2 both principals and chemistry teachers' majority were men, with percentage of 66.7% and 75% respectively. This can be attributed to society's perception about leadership and sciences particularly chemistry which have been perceived to be male fields. This therefore means that to some extent girls lack role models in school. For example some schools had male chemistry teachers only and therefore girls feel chemistry is for male. Boys on other hand are motivated since they have role models hence better performance compared to girls.

4.3.2 Teaching experience for chemistry teachers

Teaching experience for chemistry teachers participated in the study are analyzed and summarized as shown;

Table 4. 3 Teaching experience for chemistry teachers

Number of years	No. of teachers	Frequency (%)
1 year and below	1	8.33
2-3 years	2	16.67
4-5 years	5	41.67
Above 5 years	4	33.33
Total	12	100

Table 4.3 indicates that lion share of chemistry teachers had been in the teaching profession for a period of 4-5 years with frequency of 41.67 %, followed by teaching experience of above 5 years with frequency of 33.33 %. Teachers with experience of 1 year and below were minority with frequency of 8.33 % followed by those with teaching experience of 2-3 years with frequency of 16.67%. It was also discovered that teachers with more teaching experiences posted better results than those with few years of teaching experience, this could be explained by mastery of content in chemistry syllabus as well as experience on exam setting and testing as one practices the profession more.

4.3.3 Principals' years of administration in the current school

Years of administration in the current school for the principals who participated are analyzed in table 4.4

Table 4. 4 Years of administration in the current post

Years of administration	No. of principals	Frequency (%)
1 year and below	0	0.00
2-3 years	2	33.33
4-5 years	1	16.67
Above 5 years	3	50.00
Total	6	100.00

Table 4.4 indicates that no principal among those participated in the study had served a year or less in his/her current school. 33.33 % had been in charge in their current post for a period of between 2-3 years, 16.67% had been in charge of the current posts for a period of between 4-5 years and 50% have been in charge the current posts for a period of more than 5 years.

4.4 Society perception and students' academic performance in chemistry

The association among society perceptions on gender and academic performance of students in chemistry was the first question the study sought to establish. Opinions were sought from a selected number of principals, teachers and students and analyzed.

Principals.

From the study five out of six principals who participated in the study agreed that society perceptions on gender do affect students' performance in chemistry. The one who disagreed stated that it's not society's perception but rather individual choices since there are girls who perform very well yet they are members of that society.

Some of the society stereotypes that the principals stated that affect academic performance of students in chemistry included the following; society views chemistry as a very challenging hence should be done by boys since they are assertive and risk takers. They also stated that chemistry is viewed as a male subject and not for female hence the girls grow with that mentality and perception. Also the society perceives that chemistry related careers are for male and not for female.

Teachers

10 out of 12 teachers who filled in the questionnaires agreed that society perception/stereotypes do affect students' performance in chemistry. The 2 who disagreed stated that although this might

be a factor that affects student performance it may not be the main factor as there are still female students who outperform their male counterparts in the society.

Table 4. 5 Teachers opinion on society perceptions on gender and students' academic performance in chemistry

Statement	Strongly Agree (%)	Agree (%)	Not Sure (%)	Disagree (%)	Strongly Disagree (%)
There are careers for men and others for women	33.33	25	8.33	16.67	16.67
Boys are superior than girls	41.67	25	8.33	16.67	8.33
Chemistry is a difficult and challenging subject	50	33.33	16.67	0	0
Chemistry is for boys	33.33	33.33	0	16.67	16.67
There is no problem if a girl fails in chemistry	33.33	25	0	25	16.67
Girls should choose less demanding subjects	41.67	25	8.33	16.67	8.33
All students have equal opportunity to study and pass chemistry	8.33	25	16.67	25	25

Students

Students' opinions on effects of society perception on students' academic performance in chemistry were analyzed in table 4.6

Table 4. 6 Students' opinions on society perception on gender and academic performance in chemistry

Statement	Strongly agree (%)	Agree (%)	Not sure (%)	Disagree (%)	Strongly disagree (%)
My society believe that there are careers for men and others for women	35.00	32.00	10.67	13.33	9.00

In my society boys are considered superior to girls	40.33	26.67	9.00	15.67	8.33
Difficult things are done by boys in my society	37.33	40.33	4.00	11.67	6.67
Girls are given less demanding tasks at home	44.00	30.00	13.33	6.67	6.00
My society believe that chemistry is important in daily life	9.00	16.67	19.00	23.33	32.00
There is no problem if a girls fails in chemistry	15.67	24.00	5.67	28.00	26.67

Table 4.6 indicates that, most students agreed with the first four statements which show how society perceive gender differently. The society perceives that there are careers for male and others for female since they belief that male are superior to female. The fact that chemistry is branded masculine may be an explanation as to why male students performed better than female students. These findings were similar to Amedu (2015) who found out that science subjects attracts more male than female students and attributed it to masculine branding mathematics and science subjects by socio-cultural backgrounds.

4.5 Students attitude and academic performance in Chemistry

On whether there was relationship between the attitude of students towards chemistry and their performance, opinions were sought from the school principals, chemistry teachers and students and analyzed as shown below.

Principals

All the selected principals agreed that students' attitude towards chemistry do affect their performance. On the question on strategies they have come up with as the school administration to curb students' negative attitude toward chemistry, the following were given;

- ✓ Rewarding those students who performed well- this motivated them to continue working hard as well as others who did not perform well to work hard to get such rewards.

- ✓ Motivational speakers- schools invited motivational speakers to speak to students and motivate them. Most of speakers especially in girls' and mixed schools were women who had chemistry related careers in order to encourage the girls to change their attitudes towards chemistry.
- ✓ Coming up with encouraging slogans- schools had come up with slogans to encourage students and impact their attitude positively. Some of them included; chemistry is doable, chemistry is for ALL.
- ✓ Extra time allocated to sciences; most schools had remedial teaching with more hours accorded to sciences, chemistry being one of them

Teachers

All teachers agreed that students' attitude towards chemistry do affect their performance.

Teachers' opinions on students' attitude effects on their performance in chemistry were scrutinized and presented as shown

Table 4. 7 Teachers' opinions on students' attitude and academic performance in chemistry

Statement	Strongly agree %	Agree %	Not sure %	Disagree %	Strongly disagree %
Chemistry is difficult to understand	33.33	33.33	0.00	25.00	8.33
Most students opt for chemistry in my school because is compulsory	50.00	25.00	8.33	16.67	0.00
Students do not concentrate fully during chemistry lesson	58.67	16.67	16.67	8.33	0.00
Girls ask more questions in chemistry lesson than boys	16.67	16.67	0.00	41.67	25.00
Boys ask more questions in chemistry lesson than girls	33.33	41.67	0.00	16.67	8.33
Students who tend to ask questions perform better than those who do not	25.0	33.33	8.33	16.67	16.67

Boys show more interest in chemistry compared to girls	41.67	33.33	8.33	16.67	0.00
Girls show more interest in chemistry compared to boys	16.67	16.67	8.33	33.33	25.00
Boys are more determined than girls in solving difficult problems on their own	41.67	33.33	0.00	16.67	8.33

Table 4.7 indicates that all the questions with negative attitude towards chemistry scored high compared to those with positive attitude. For example the statement on chemistry is difficult to understand, 66.66% agreed that students believed that with only 33.33% disagreeing, and on the statement students do not concentrate fully during chemistry lesson, 75.34% agreed with only 8.33% disagreeing. Also on the attitude difference between students there was an indication that male students had positive attitude toward chemistry while female students had negative attitude. For example on the statement about interest, 75% of the teachers agreed that male showed more interest in chemistry compared female students with 16.67 disagreeing, on other hand 33.34% agreed that female showed more interest than male with 58.33% disagreeing, this may explain why male students did well than female students in KCSE in chemistry. The findings agreed with that of Yungungu (2015), who found out that interest in chemistry influences performance as it provides motivation within the student to learn.

Students

Students' opinions on students' attitude and how it affects their performance in chemistry were examined and presented in table 4.8

Table 4. 8 Students' opinions on students' attitude and academic performance in chemistry

Statement	Strongly agree %	Agree %	Not sure %	Disagree %	Strongly disagree %
I like chemistry	21.33	15.00	4.00	32.67	27.00
Chemistry is for boys	32.33	25.33	3.33	19.00	20.00
Chemistry is a difficult subject	37.67	35.67	0.00	12.33	14.33
Chemistry is an interesting subject	19.33	20.00	5.00	30.67	25.00

I feel anxious towards chemistry tests	38.67	27.67	10.00	14.00	9.67
I opted for chemistry because is a compulsory subject in my school	40.00	29.33	0.00	15.67	15.00
I opted for chemistry because of my career aspirations	14.00	19.00	7.33	27.67	32.00
My friends influence my like/dislike of chemistry	30.00	33.00	12.33	12.67	12.00
I enjoy chemistry lessons	16.67	17.33	11.67	29.67	24.67
Chemistry lessons are very boring	30.67	36.33	4.00	15.67	13.33

Table 4.8 indicates that most of the students were in agreement with all the negative statement and disagreed with all the positive items. For example 73.34% agreed that chemistry is a difficult subject with 26.66% disagreeing while 39.33% agreed that chemistry is an interesting subject with 55.67% disagreeing. The rejoinders suggested a negative attitude towards chemistry by the students. An explanation to this could be that chemistry is a compulsory subject in most secondary schools, so even those who don't like it have no option but to take it, this may explain general poor performance in chemistry compared to other subjects which are optional. This could also explain why there is poor performance in chemistry.

4.6 Family environment and students' performance

The third research question sought to establish whether there was a correlation between students' family environment and their academic achievement in chemistry. Opinions were sought from principals, chemistry teachers and students, analyzed and presented as shown;

Principals

4 out of the 6 principals who took part in the study agreed that family environment affect students' performance with 2 disagreeing. Those who disagreed stated that there are students from very poor backgrounds, some with uneducated parents and other even orphans who performed better than some of their counterparts from well off families. This could be associated with the fact that such learners want to bring change to their families and therefore their desire to study hard and therefore good performance.

Teachers

7 out of 12 chemistry teachers who participated in the study agreed that family environment affect students' academic performance in chemistry. The remaining 5 disagreed stating that there are students from poor backgrounds who perform better than some from well off families. One also stated that there are parents who come to them to seek out why their children are not performing well yet they provide every support needed. This could be attributed to those students desire to bring solutions in their families.

Students

Students' opinions on how family environment affects their academic performance in chemistry were analyzed as indicated

Table 4. 9 Family environment and students' performance

Statement	Strongly agree %	Agree %	Not sure %	Disagree %	Strongly disagree %
My family influences my like/dislike of chemistry	34.33	29.00	7.33	13.33	16.00
My parents'/guardians' occupation influences my interest in education	31.33	26.33	10.00	15.67	16.67
My parents/guardians career inspires me to work hard to be like them	31.67	33.00	6.67	15.33	13.33
There are chores for boys and for girls in my family	30.00	24.67	10.33	19.67	15.33
All my siblings we are given equal attention	22.00	24.00	7.33	24.33	22.33

Table 4.9 indicates agreement with all positive items on family environment/background and students' academic performance in chemistry by majority of the respondents. For example 64.67% agreed that their parents/guardians career influenced their interest in education. The findings were

similar to Suman (2011) findings who established that performance of students is influenced by their parents' occupation.

4.7 Results of Research Questions

A total of 300 students responded to the questionnaire. From the data given by the students mean totals were computed and conveyed as the mean for the effects of gender on each gender aspect. The information given by the principals was used to retrieve academic performance data and compared with the data reported by the KNEC. KCSE scores in chemistry from 2015-2019 were used to establish the relationship between different aspects of gender (society perception, students' attitude and family environment) and academic performance of students in chemistry. Culture is gradual and takes time to change, with this consideration it was assumed that the current and the former secondary students had similar cultural setting therefore they are likely to presume effects on gender

4.7.1 Analysis of Research Questions

Research Question one

How are society perceptions on gender and students' academic performance in chemistry in secondary schools in Kenya related?

SPSS was used to compare students' opinions scores on society perception and students' performance in chemistry. Possible relationship between society perception and student academic performance was determined using Pearson correlation coefficient. Table 4.10 indicates the results as obtained.

Table 4. 10 Correlational analysis of society perceptions and students' performance in chemistry

		Society perception	Performance(KCSE)
Society perception	Pearson	1	-0.391
	Correlation(r)		
	N	300	300
Performance(KCSE)	Pearson	-0.391	1
	Correlation (r)		
	N	300	300

Table 4.10 shows that there was a negative correlation between society perceptions on gender and performance in chemistry. The value of coefficient was $r(300) = -0.391$. The implication of this is that performance decreased by 0.391 for every unit increase in society perception, therefore the more student agreed/subscribed to what society considered appropriate to male or female the poorer their grades. Since r is negative we can conclude that society perception has a negative influence on students' performance in chemistry. The findings were similar to Karuti (2015) that found that gender constructions and academic achievement had a negative correlation.

Research question two

Does students' attitude and academic performance in chemistry in Secondary schools in Kenya have any relationship?

SPSS was used to compare students' opinions scores on attitude of students and their performance in chemistry. Possible relationship between students' attitude and student academic performance was determined using Pearson correlation coefficient (r). Summary is given in Table 4.11

Table 4. 11 Correlational analysis of students' attitude and students' performance in chemistry

		Students' attitude	Performance(KCSE)
Students' attitude	Pearson	1	-0.557
	Correlation(r)		
	N	300	300
Performance(KCSE)	Pearson	-0.557	1
	Correlation (r)		
	N	300	300

The value of the coefficient $r(300) = -0.557$ designated a negative correlation between student attitude and performance in chemistry. The results from students' attitude showed that students attitude toward chemistry was negative. This agrees that students' attitude influences their performance. The negative correlation implies that in every one unit increase in students' attitude (negative) performance decreases by 0.557. The findings concurred with Baraiywo (2019) who found out that students' attitude towards biology influenced the academic performance in the subject with those with a positive attitude performing better than those with a negative attitude.

Research question three

Does family environment and academic performance of student in chemistry in secondary schools in Kenya have any correlation?

SPSS was used to compare students' opinions scores on family environment and students' performance in chemistry. Possible relationship between family environment and student academic performance was determined using Pearson correlation coefficient (r).

Table 4. 12 Correlational analysis of family environment and students, academic performance in chemistry

		Family environment	Performance(KCSE)
Family environment	Pearson	1	0.188
	Correlation(r)		
	N	300	300
Performance(KCSE)	Pearson	0.188	1
	Correlation (r)		
	N	300	300

From the results family environment and academic performance of students showed a positive correlation. The value of the coefficient was $r(300) = 0.188$. This implied that family environment influence students' performance. The positive relationship indicated that students from well off families performed better than those from poor families. The results were in agreement with Khan (2019) and Younas (2020) who found home environment and students' academic achievement had a positive relationship. The findings however contradicts those of Baraiywo (2019) which stated socio-economic status of parents and academic performance in biology had no relationship.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The findings summary, conclusions drawn from the findings and further research recommendations will be discussed in this chapter

5.2 Summary of findings

Examining the relationship on effects of gender and academic performance of students in chemistry in secondary schools in KituiSouth sub-county, Kitui County, Kenya was the purpose of the study. The effects were examined with respect to society perception, students' attitude and family environment on gender. Three research questions were put forward and answered using Pearson Correlation coefficient. The results were as follows:

- i. There was a negative correlation ($r = - 0.391$) between society perception and students' academic performance in chemistry.
- ii. There was negative correlation ($r = -0.557$) between attitude of students towards chemistry and how they performed in the subject.
- iii. There was positive correlation ($r = 0.188$) between family environment and students' academic achievement in chemistry.

5.3 Conclusions

There has been a link in secondary schools in Kenya between gender and academic performance. Students tend to perform differently in different subjects based on their gender. From this study findings there was confirmation that there is indeed a relationship between different aspects of gender (society perception, student attitude and family environment) and academic performance of students in chemistry in secondary schools in Kitui South sub-county. Grounded on these findings following conclusions were made;

- i. Society perceptions influenced students' academic performance in chemistry. Students who subscribed to what society considered appropriate for male or female were negatively affected in their performance.
- ii. Students' attitude towards chemistry affected their performance in the subject. Students' with a negative attitude towards chemistry performed poorer in the subject compared to those who had a positive attitude.

- iii. Family environment influenced students' academic performance in chemistry. Students from favorable family environment performed better than those from unfavorable family environment.
- iv. Comparing the three aspects, students' attitude affected their performance the most followed by society perceptions and lastly family environment.

5.4 Recommendations

Number of recommendations were put forward based on the findings;

- i. Guidance and counseling to be offered to students in order to change their mindset on some of the beliefs that they hold towards chemistry. For example from the findings 73.34% of the respondents agreed that chemistry was a hard subject, this was really a huge percentage and with such mindset the student will continue to perform poor in the subject hence need for change of mindset
- ii. Appropriate instructional methods to be used in order to heighten students' attitude towards chemistry and be motivated to change their attitude from negative to positive to boost the subject performance.
- iii. Community based forums which are structured unambiguously towards strengthening participation of parents in their children education should be devised by the relevant authorities in the education sector

5.5 Suggestions for Further Research

For further research, suggestions were made which included;

- i. This study was conducted in Kitui South Sub-county. To advance the generalization of the results a study can be conducted in large number of schools and in different sub-counties and counties.
- ii. The study sought to establish if gender aspects had any effects on students' academic performance in chemistry. Only three aspects, that is society perception, students' attitude and family environment were considered, there is need to investigate other aspects which may affect performance of students in chemistry.
- iii. Only gender effects on students' academic performance in chemistry were the focus for the study. Other factors which may affect students' performance apart from the gender aspects need to be explored.

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APPENCIES

Appendix I: Introductory Letter

Ann Mutio

University of Nairobi

Dear sir/madam

I am student in the University of Nairobi pursuing Postgraduate Diploma in Education. I am currently conducting a research on Effects of gender on students' academic performance in chemistry in secondary schools. A case of Kitui South sub-county, Kitui County, Kenya. On the attached questionnaires kindly fill in adhering to instruction. The purpose for the information is to generate data for academic use only. Your cooperation and participation is greatly appreciated. Thank you.

Yours faithfully

Ann Mutio

Appendix II: Principals' Questionnaire

The use of this questionnaire is to gather data for academic purpose. Put tick (✓) to the correct option. Be free to give your honest answer because there is no right or wrong answer

SECTION A; General information

- 1. Your gender kindly
 - a) Male [] b) Female []
- 2. Which type/category is your school?
 - a) Boys [] b) Girls [] c) Mixed []
- 3. Years of administration in the current school
 - 1 year and below [] 2-3 years [] 4-5 years [] Above 5 year []

SECTION B: Society perception on gender

- 1. In your opinion do society perceptions/ stereotypes affect students' performance in chemistry?
 - Yes [] No []
- 2. What are some of the stereotypes/perceptions does the community has towards study and performance in chemistry for girls and boys?
 -
 -
 -

SECTION C: Student attitude and performance

- 1. In your opinion does student attitude towards chemistry affect their performance?
 - Yes [] No []
- 2. What are some strategies as a school you have come up with to curb this?
 -
 -
 -

SECTION D: Family environment and performance

- 1. In your opinion does family environment have effects on students' academic performance in chemistry?
 - Yes [] No []

THANK YOU

Appendix III: Chemistry Teachers Questionnaire

The purpose of the questionnaire is to gather academic data. Put tick (✓) to the correct option.

Feel free to give your honest answer

SECTION A: Basic information

- Your gender please
 - Male []
 - Female []
- Which type/category is your school
 - Boys' []
 - Girls' []
 - Mixed []
- How long have you been teaching chemistry
 - 1 year and below []
 - 2-3 years []
 - 4-5 years []
 - above 5 years []
- Have you had the opportunity to teach both girls' and boys' chemistry?
Yes [] No []

SECTION B: Society perception and academic performance.

- In your opinion, does society perceptions/stereotypes have effects on students' academic performance in chemistry?
Yes [] No []
- How would you rate the effects of Society perception on gender in students' performance in chemistry on the attributes below? Tick [✓] where appropriate

Statements	Strongly agree	Agree	Not sure	Disagree	Strongly disagree
There are careers for men and others for women					
Boys are superior than girls					
Chemistry is a difficult and challenging subject					
Chemistry is for boys					
There is no problem if a girl fails in chemistry					
Girls should choose less demanding subjects					

All students have equal opportunity to study and pass chemistry					
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SECTION C. Students' attitude and performance.

1. In your opinion, does student's attitude toward study of chemistry have an effect on his/her performance?

Yes []

No []

2. How would you rate the students' attitude effects and their academic achievement in chemistry on the below given attributes. Tick [✓] where appropriate

Statement	Strongly agree	Agree	Not sure	Disagree	Strongly disagree
Chemistry is difficult to understand					
Most students opt for chemistry in my school because is compulsory					
Students do not concentrate fully during chemistry lesson					
Girls ask more questions in chemistry lesson than boys					
Boys ask more questions in chemistry lesson than girls					
Students who tend to ask questions perform better than those who do not					
Boys show more interest in chemistry compared to girls					
Girls show more interest in chemistry compared to boys					

SECTION D: Family environment and student performance

In your opinion does family environment have effects on students' academic performance in chemistry?

Yes [] No []

THANK YOU

Appendix IV: Students' Questionnaire

The purpose the questionnaire is to gather academic data. The information shared will be confidential. Put tick (✓) to the correct option. Be free to give your honest answer. There is no incorrect and correct answers.

SECTION A: General information

1. Your gender please
Male [] Female []
2. Which type/category is your school
a. Boys' [] b Girls' [] c Mixed []

SECTION B: Society perception and academic performance

How would you rate the effects of Society perception on gender in students' performance in chemistry on the attributes below? Tick [✓] where appropriate

Statement	Strongly agree	agree	Not sure	disagree	Strongly disagree
My society has perception that there are careers for men and others for women					
In my society boys are considered superior to girls					
Difficult things are done by boys in my society					
Girls are given less demanding tasks at home					
My society believe that chemistry is important in daily life					
There is no problem if a girls fails in chemistry					

SECTION C: Students' attitude and performance in chemistry

The following statements are some of the attitude shown by students towards chemistry. Please respond by ticking [✓] the most appropriate according to you.

Statement	Strongly agree	agree	Not sure	disagree	Strongly agree
I like chemistry					

Chemistry is for boys					
Chemistry is a difficult subject					
Chemistry is an interesting subject					
I feel anxious towards chemistry tests					
I opted for chemistry because is a compulsory subject in my school					
I opted for chemistry because of my career aspirations					
My friends influence my like/dislike of chemistry					
I enjoy chemistry lessons					
Chemistry lessons are very boring					


SECTION D: Family environment and students' performance in chemistry.


The following statements are some aspects of family environment that have effects on students' academic performance in chemistry. Please respond to all by choosing the most appropriate to you.

Statement	Strongly agree	agree	Not sure	disagree	Strongly disagree
My family influences my like/dislike of chemistry					
My parents'/guardians' occupation influences my interest in education					
My parents/guardians career inspires me to work hard to be like them					
There are chores for boys and for girls in my family					
All my siblings we are given equal attention					

THANK YOU


Appendix v: Research Permit


REPUBLIC OF KENYA


**NATIONAL COMMISSION FOR
SCIENCE, TECHNOLOGY & INNOVATION**

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