

**THE RELATIONSHIP BETWEEN ATTITUDE AND
ACADEMIC PERFORMANCE IN CHEMISTRY AMONG
SECONDARY SCHOOL STUDENTS.
A CASE OF CENTRAL KISII DISTRICT, KENYA**

BY

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DECLARATION

Declaration by the candidate

This study is my original work and has not been presented for a degree in any other university. No part of this thesis may be reproduced without the prior written permission of the author and /or Moi University.

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Declaration by Supervisors

This thesis has been submitted with our approval as University Supervisors.

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DEDICATION

This work is dedicated to my dear husband Mr. R. Michieka and my beloved children Abner, Josephine and Samson.

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May glory be to the Almighty God for providing me with the strength, good health and motivation during the course of this study and has enabled me to write this piece of work.

Many thanks also go to my husband Mr R. M. Michieka, my children Abner, Josephine and Samson, friends and relatives who morally and financially supported me. I am indebted to them for their generosity.

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ABSTRACT

Chemistry contributes to both social and economic development of man. However in Kenya the performance of learners at the end of secondary school course (form four) in chemistry National Examination levels has remained poor. It is on this basis that this study focused on the relationship between attitude and achievement/performance in chemistry to establish if this psychological aspect contributes to achievement amongst many other factors. The study was carried out in Kisii Central District, Nyanza Province, Kenya. It was guided by the following research objectives ; to determine the relationship between the students' attitude towards chemistry and their achievement in the subject, to determine the boys' and girls' attitude towards chemistry from single sex and mixed secondary schools, to establish the relationship between boys' and girls' attitude towards chemistry and their performance in the subject and to establish the relationship between the category of school and the attitude held towards chemistry. The study was advanced by a theoretical framework based on Thorndike's theory of connectionism.

From the literature reviewed it was evident that other factors such as availability of resources, instructors, teaching methods among others have been considered. But little has been done concerning attitude in relation to achievement in chemistry especially in Kenya. Hence it was deemed necessary to delineate the study into this respective subject as it is considered singly during instruction and even evaluation.

The study employed a cause comparative research (Ex-post-facto) design. Stratified, clustered and simple random sampling techniques were used to obtain the sample for study. Thirty secondary schools were sampled from a population of 85. The students sampled were 1172 out of the total district population of 6173 form four students. To answer the research questions and test the null hypotheses, data was gathered by a student questionnaire whose validity and reliability were first established ($r = 0.7$). Data analysis was done using both descriptive and inferential statistics using SPSS program.

Data analysis revealed that the students' attitude towards chemistry was generally neutral and this accounts for the dismal performance in chemistry. There was a difference in gender attitude towards the subject and male students perform better than female students. Type and category of school also play a role in the attitude a student holds towards chemistry and this at the end affects the overall performance.

In view of the findings, it is recommended that relevant stake holders to continue promoting positive attitude towards chemistry and motivate students to work hard in order to achieve better in the subject as it cuts across all science related careers. It is therefore suggested that more research be done to establish the possible causes of the state of 'confusion' that exists amongst learners that drive them to perform poor in chemistry, why there exists gender difference in attitude and performance, establish the relationship between the teachers' attitude towards the teaching of chemistry and extend the study to the entire country to establish the extent to which attitude influences academic performance.

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CHAPTER ONE

INTRODUCTION TO THE STUDY

1.0 Introduction

The chapter presents the background of the study that briefly highlights the need for the current study. This is then followed by the statement of the problem, justification of the study, significance of the study, objectives of the study, the research questions, research hypotheses, assumptions of the study, scope and limitation of the study, and theoretical frame work. The chapter ends with operational definition of some terms used within the chapter.

1.1 Background to the study

Chemistry is a branch of science that deals with the study of the composition, structure and properties of matter. Like any other intellectual discipline, it provides the means by which the individual can organise his or her concepts and attitudes, classify experiences and communicate with others (Wellington, 1989). Being a scientific field, it contributes greatly to other fields of study such as; medicine, agriculture, engineering and technological areas for the improvement of the quality of life and generation of wealth for the good of the entire human race. The teaching of chemistry in schools just like any other subject depends on the demands of the society. The centrality of chemistry in the curriculum is evident from the concern shown in the policy reports such as in the Koech commission report of 1998 which notes that:

‘Science teaching and examinations should be oriented to problem solving approach. Children should be exposed to scientific concepts from an early age (Republic of Kenya 1998, p.23)’.

To determine whether the learners have benefited or have acquired the necessary intellectual and practical skills, an evaluation is done through administration of exams at various levels in the form of continuous assessment tests , end of term exams and end of year exams(both internal and external). However the performance of the form four students in chemistry at the end of the course has been rather poor as evident from table 1.1

Table 1.1: Central Kisii District mean scores for Sciences and Geography in K.C.S.E

YEAR	BIOLOGY	PHYSICS	CHEMISTRY	GEOGRAPHY
2005	4.326	2.764	3.432	4.213
2006	3.737	2.102	3.136	5.341
2007	4.453	2.675	3.726	4.923
2008	3.689	2.681	3.024	3.772

Source: KNEC examination analysis for the years 2005-2008

The performance of students in chemistry examinations in secondary schools is poor as shown in table 1.1 and hence is an issue amongst educators, the government, parents, employers and students. This poor performance may be due to lack of adequate teaching-learning resources, poor teaching methods, lack of library and laboratory facilities among many other reasons (Maundu ,1986). In Kenya some researches have been done like that of Eshiwani(1983), Maundu(1986), Twoli(1986), Orodho (1996) and Njuguna(1998) on the factors affecting achievement in sciences. However these studies have not specifically

addressed the relationship between attitude and achievement in chemistry. Hence the need to study this aspect to establish whether there is any relationship between the two.

From the table1, it is evident that the mean marks for chemistry subject are low and below average. The situation therefore, undoubtedly needs improvement. This can be done by finding out the causes of failure if research is carried out in various areas such as teaching and learning facilities, classroom capacity, training of teachers, academic workload , psychological factors, which include motivation and attitude.

Chemistry is a practical subject guided by theoretical literature in the textbooks. Lack of laboratory facilities for practical work and reference books are likely to lead to poor performance in the subject (Tamir, 1974). The number of students in a given class may also play a great role in determining the amount of attention given to each individual student by the teacher. The slow learners may be helped to catch up with the fast learners. Equally the fast learners may be appropriately occupied so as to avoid boredom in the learning process. When there is a large number of a student than is appropriate for the teacher to cater for individual differences, the learners may not achieve well. If there happens to be poor achievement, this may lead to development of poor attitude towards learning (Maundu, 1986).

Another factor may be teacher qualification. A well qualified teacher who uses appropriate methods in teaching and learning is likely to assist learners to have a better achievement orientation (Orodho, 1996). He or she will try to apply appropriate motivation methods and use instructional materials, which are agreeable with the learners' condition and learning situation. Inadequate training of teachers therefore is likely to influence achievement in a way although this may not always be the case.

According to Ndonga (1999), heavy academic workload, which is unbearable with the learners, is likely to affect achievement. An overloaded and heavily taxed mind is likely to make a learner more susceptible to irrational and poor receptivity in a learning situation. Such conditions of the mind do not augur well with effective teaching and learning process and hence poor performance.

Considerable importance is attached to promotion of favourable attitude to school work. The liking for and interest in chemistry subject can lead to greater effort and hence higher academic achievement. Equally a favourable attitude can lead to the willingness to pursue the subject in subsequent studies (Kegan, 1972).

From these reasons for poor performance in chemistry, attitude as a factor has not been considered. Therefore, this study was concerned about students' attitude towards chemistry and how this relates to their academic achievement in the subject.

1.2 Statement of the problem

The 8-4-4 system of education was introduced in Kenya with a noble idea of ensuring that students graduating at every level have some scientific, practical and technological knowledge and skills that will be utilised for self or salaried employment (Republic of Kenya, 1985). In order to prepare and equip the youths of this country for their future life, it will be necessary to equip them with basic scientific knowledge, skills and attitudes for technological advancement (Republic of Kenya, 1976 and 1985). Chemistry plays a major role in this respect as it emphasises the learners' acquisition of scientific knowledge, practical skills, which would be utilised in self employment and in industry (both formal and non formal). However students' performance in this subject has been

very poor at K.C.S.E level and it is not very clear why such performance and yet the necessary facilities and personnel are available.

1.3 Justification of the study

Academic performance of secondary school students in chemistry within the district when compared with other neighbouring districts like those of the Luo Nyanza is discouraging. It is in this regard that this study was undertaken to investigate besides other possible determinants how the attitude held by secondary school students towards chemistry might influence their academic performance in this subject.

It was also necessary for this study to be done since no similar study has been undertaken in the district yet the performance standards in the subject continues to deteriorate. The findings of this study would help understand the current academic achievement situation in the district. More over, having a great desire that the educational standards in the district be improved, the researcher carried out the study within the district and in the discipline that is familiar to her.

1.4 Significance of the study

This study concerning the relationship between attitude and academic achievement in chemistry plugs a hole into the quest to find a solution for the poor performance in this subject. This is a problem in the Ministry of Education, the other interested groups and the stakeholders such as parents, Female Education in Mathematics and Science Association (FEMSA), Japanese International Corporation Agency (JICA) who have all long had concern about the dismal performance in Sciences and Mathematics.

Equally the findings of this study add up to the knowledge about the effects of attitude on academic achievement not only in chemistry but also in the other academic fields. Through this knowledge various strategies can be established and policies be put in place to curb the poor performance.

1.5 Objectives of the study

This study was guided by the following objectives. These were to:

- i. Determine the relationship between the students' attitude towards chemistry and their achievement in the subject.
- ii. Determine the boys' and girls' attitude towards chemistry from single sex and mixed secondary schools.
- iii. Establish the relationship between the boys' and girls' attitude toward chemistry and their performance in the subject.
- iv. To establish the relationship between the category of school and the attitude held towards chemistry.

1.6 Research questions

The study provided answers to the following questions:

1. What is the relationship between the students' attitude towards chemistry and their achievement in the subject?
2. Is there a difference between attitude towards chemistry between students from single and mixed schools?

3. What is the relationship between the boys' and girls' attitude towards chemistry and their achievement in the subject?
4. What is the relationship between the students' attitude towards chemistry and the category of school?

1.7 Research hypotheses

The following null hypotheses were tested using the data obtained:

H₀1: There is no significant relationship between students' attitude towards chemistry and their performance in the subject.

H₀2: There is no significant difference between the boys' and girls' attitude towards chemistry and their performance in the subject.

H₀3: There is no significant difference between boys and girls' attitude towards chemistry from single and mixed secondary schools.

H₀4: The category of school has got no significant influence on students' attitude towards chemistry.

1.8 Assumptions of the study

The following assumptions were made about the study:

- a) Students selected for the study had already formed stable attitudes towards chemistry and therefore would respond to the research instruments honestly.
- b) Teachers have adhered to the laid down secondary school academic syllabus and therefore the students have not been disadvantaged in lower classes.

1.9 Scope of the study

The study was carried out in Central Kisii District, Nyanza Province. Provincial, District and Private secondary schools were investigated. The schools constituted those of boys' single, girls' single and mixed secondary schools. The study focused on the influence of attitude on academic performance in chemistry within the district.

1.10 Limitation of the study

The current study investigated the relationship that exists between student attitude towards chemistry and their academic achievement in the subject. Lack of adequate literature on chemistry made the researcher to review literature on sciences. Only four students were investigated.

1.11 Theoretical frame work

The theoretical framework was developed from the connectionism theory advanced by Thorndike. It is a general theory of learning for both animals and humans. This learning theory represents the original stimulus- response framework of behavioural learning theory. According to the theory, learning is the result of associations formed between stimuli and responses. Such associations or habits become strengthened or weakened by the nature and frequency of the stimulus-response pairings. Therefore learning requires both practice and rewards .Transfer of learning occurs because of previously encountered situations.

Thorndike developed a theory of learning from the results of his experiments with animals (cats) in a puzzle-box (Gross, 1996). In his experiment, the cats were to operate a latch, which could automatically cause the door to spring open. Each time they managed to escape, there was a piece of fish for them, which was visible from inside the puzzle-box. Each time after eating the fish, the cats were put straight back in the box and the whole process was repeated.

The findings of this experiment would be generalised to human beings. In a problem situation which the learner wants to overcome, the learner tries a number of possible responses and whichever is rewarding is gradually stamped in. The learner connects this response to problem solution and is likely to be repeated whenever such situation recurs, hence the theory of connectivism (Hilgard and Bower, 1974).

Thorndike identified three major laws in the theory namely; readiness, exercise, and effect which subsumes the construct attitude. Readiness is an accessory principle, which characterises the circumstances under which a learner tends to be satisfied or annoyed. Such circumstances include the ease or difficulty of carrying out the task. In relation to this study, if learners are assigned difficult tasks beyond their abilities, they may develop negative attitude towards the subject and vice versa.

According to Thorndike, exercise refers to strengthening of connections with practice and the weakening of connections or forgetting when practice or use is discontinued. Chemistry is a practical oriented subject. When the learners are taught theoretically without any practical work, the subject may become difficult and abstract. Thus their

performance may be drastically affected. When they are exposed to practical work, the subject may be interesting and understandable since they can observe how various processes take place practically.

Effect on the other hand refers to the weakening or strengthening of a connection as a result of its consequences. When a connection is accompanied or followed by satisfactory state of affairs the strength of the connection is increased or otherwise it is decreased. During evaluation, if the learners score well and they are motivated, then their attitude towards the subject may also be positive. But if the examinations set are difficult and the learners perform poorly, their effort may be de-motivated leading to the development of unfavourable attitude towards the subject. The attitude not only determines what the person will do but also what will satisfy or annoy, how well he/she will perform a given task, and judges reinforces or punishes his own performance accordingly.

This theory predicts that one's own standards, expectations and aspirations that are acquired in the process of socialisation would affect his learning. Consequently, a student with a negative attitude towards a subject could be more satisfied with low scores than a student with positive or favourable attitude towards the subject. On the basis of this theory therefore, the present study examined whether there is a relationship between the learners' attitude towards chemistry subject and their academic achievement in the subject.

1.12 Definition of terms

Attitude- This is a state of readiness, tendency to react or act in a certain manner when confronted with a certain stimuli. In the study, attitude was measured by use of an attitude questionnaire where by the items were based on a five point Likert scale. Each item was scored and the average determined. Any respondent on each item with a score between 0 - 1.7 was considered negative, between a score of 1.8 - 3.3 was taken to be neutral and that with a range of 3.4-5.0 was considered positive. Also from the total scores of the items, a student who scored 74 and above were considered as having positive attitude, those with marks ranging between 48 – 73 were considered neutral and those with 47 and below were considered as having negative or unfavourable attitude

Academic achievement-This is the manifestation of learning that has taken place. It is measured by the scores obtained at the end of a session, topic, end of a term or at the end of a course. In the case of this study, end of form four course examination marks were used to reflect this parameter.

Chemistry achievement – This refers to the knowledge of chemistry, facts, conceptions, skills and principles as measured by chemistry evaluation tests. In this study form four results obtained from the Kenya National Examination Council were used. They were compared with the scores obtained from the attitude scale scored by the same students to establish their correlations.

School category- This refers to the grouping of schools based on the rank nation wide. In this study, there were three categories of schools i.e. provincial, district and private schools.

Type of school- This refers to a class of schools based on the kind of sex of students present. In the study, schools are of three types namely single girl schools, single boy schools and mixed school (with both male and female students).

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter presents the review of the relevant literature to the study. The literature reviewed for the purpose of this study was that based on sciences. Hence this chapter reviewed students' attitudes and their achievement in chemistry (science), attitude change and development, gender differences in attitude, achievement in schools, and literature on research in science.

2.1 Students attitude towards and their achievement in chemistry

Attitude held towards a school subject is very important in the learning of the subject (Ndonga, 1986). The attitudes held by students towards chemistry are of great importance either as an educational outcome of intrinsic importance or a determinant in chemistry achievement.

Njuguna (1998) carried out a study on the relationship between form four students' attitude towards science subject and their academic achievement in these subjects. He established that there was a positive significant relationship for the study group in physical sciences. He then recommended that it is necessary for teachers to promote favourable attitude in learners. Banu (1985) on the other hand examined attitude towards science held in secondary school students in Nigeria. Their attitude towards science and variables thought to affect the development of positive attitude towards science subjects were investigated. There was an indication that 69% of the students preferred science

courses to other subjects. Quite a high percentage (70%) of the student also indicated that they could like to join science-related subjects. The result also showed that male students in general held a more positive attitude towards science as compared to the females.

Slater (1977) conducted a study based on creativity measures of fluency, flexibility and originality and the relationship between attitude towards science and criteria associated with success in secondary school sciences. The students were observed over a period of five years (from the seventh grade to eleventh grade). The Torrance test of creativity, the Iowa Test of Basic Skills, the large Thorndike Intelligence Test and the Scientific Attitude Inventory were administered and academic grades obtained for science courses completed in secondary school. The findings of this study indicated that the student possessing the most positive attitude towards science scored highly on flexibility component of creativity.

Burrow (1978) conducted an investigation. He dealt with the locus of control views of tentativeness of science, attitude towards science instruction, perception of teaching strategies and science achievement among secondary school course groups of General science, Biological science and physical sciences. The subjects were secondary school students who were enrolled in co-educational public high schools with grade nine to twelve. From the analysis of the result it was found that students who have a favourable attitude towards science instruction had a better achievement in the science class.

In another study Krajovich (1978) focused of the relationship of various variables. Among them was a relationship between science attitudes in relation to science

achievements. He used the Image of Science and Scientific Scales (ISSS), which were validated during a pilot study involving 414 subjects in grades seven through twelve and science teachers. The instrument was administered to two groups of the ninth-grade student from a sub urban school District in New Jersey. The first group constituted of 204 students that were randomly sampled from three Junior High Schools. The second group had 47 high ability students as determined by participation in advanced science courses. The study involved ninth grade students because the entire subject had identical science background. The reason as to why a group of high ability student included was because there was a need of finding out whether the relationship that existed within a large sample also existed within a group of students who were likely to enter the area of science as a career. The short form test of academic aptitude (for a measure of intelligence), the comprehensive test of basic skills (for a measure of aptitude) and a comprehensive test of basic skills and science were administered to the two groups. To determine the relationship between the variables, Pearson correlation was used. According to the findings, science attitude was positively related with science achievement. In addition multiple regression analysis showed that science attitude had an additional significant effect on science grades in conjunction with IQ. Those with positive attitude tend to achieve better in sciences. The result also showed that males in general held a more positive attitude towards science as compared to females.

Stoner (1981) investigated the relationship of psychological and skill factor to science attitude and achievement of fifth and ten grade students. He also investigated the central attribution for success and failure. The study was based on the rationale that a child's

psychological factor (perception, attitude) may be related to his / her interest and achievement in science. A sample of 312 tenth grade student in a school district located in middle and upper-middle social-economic sub- urban areas of Southern California took part in the study. The researcher developed and administered an instrument for assessing attitude toward science and other psychological variables. Teachers of given grades were used to provide the measure of achievements. In the tenth grade the result showed correlation between attitude and achievement in science for both boys and girls.

In another investigation Talton (1984) addressed the relationship of classroom environment and attitude towards science and achievement in science among the tenth grade biology students. Subjects comprised of 150 students enrolled in 70 biology classes. An attitude instrument was administered to obtain measure of student's attitude towards science. The teacher reported semester grade were used to provide measures of student's achievement. The findings of this study showed a weak positive relationship between attitude towards science and achievement in science. Further the research noted that the large number of interactions in the classrooms such as those occurring among students, teachers, peers and curriculum influenced both attitude and achievement of students in sciences.

In Kenya, researches that have been done on science have their drive on the basis of poor achievement on science subjects. Kyalo(1984), in his study found that lack of appropriate apparatus hinders effective science teaching and this implies that students are unable to acquire the necessary practical skills.

Eshiwani (1974) also emphasized that the teaching methods in science have for a long time been geared to the pursuit of knowledge per se and due to such approach, the teachers are more concerned with theoretical approach rather than the practical approach. This has made practical oriented subjects to be hard and abstract to be understood by learners.

The Common Wealth seminar report (1976) also indicated that the state of science teaching in Common Wealth Caribbean countries for a long time has been hindered by lack of science equipment and hence the type of science taught in the majority of the countries is “nature study”. However most countries have attempted to develop and introduce to their schools system structured science program, which is related to their local environment. The Republic of Kenya report (1964) emphasized that the quality of science education and the utility of science education ultimately depends on the quality, devotion, perseverance and the skills of the science teacher.

In relation to the current study, promotion of practical skills, appropriate teaching methods, skilled and innovative science teachers may help to promote favourable attitude towards chemistry among secondary school students. This in turn may lead to better academic achievement in this area. Also the introduction of general science in secondary schools in Kenyan education system will enable the students who are not capable of performing well in each specific science subject where the content covered is deep and wide to resort to another choice of subjects where the content is bearable in terms of area of coverage. This will enable the low achievers to deviate from pure chemistry to create

room for higher achievers in the area. This in turn may also lead to better performance in chemistry.

Therefore from all these studies, it is evident that there is no researcher who has specifically focused his /her study on the relationship between attitude and achievement in chemistry as a subject of it's own since it is taught and examined separately. In view of these findings, the researcher investigated the possible relationship between attitude and student achievement in chemistry at form four school level in Kisii District.

2.2 Attitude development and change

Attitude develops in a variety of ways. They can be passed on to the learners by parents; or they can be learned from members of society. They can also be learned or acquired by learners on their own. Evans (1972) argues that attitude and interest can be learned; what form they take is not determined at birth or earlier, but depends on the environment in which the child grows up and the treatment he or she receives.

According to Bell (1980), the home, school and the wider society all play an important roll in inculcating attitude since a child grows up at home and later moves to school. Attitudes develop as an individual copes and interacts with the environment. It develops in order to protect one's self esteem. Once the attitudes develop, they give regularity to moods of reaction and also regulate social adjustment.

During earlier years of childhood, attitudes are largely influenced by members of the family (Evans, 1972). Parents are the key influencers and there exist a similarity between attitudes of parents and those of their children. As children grow they come into contact

with other socialization agents like the school, the church and the peer group. Such interaction changes the previous held attitude and leads to development of new ones. These attitudes changes to conform to those held by the community (Gross, 1996).

In summary, attitudes develop and change through life. The process of development and change is facilitated by the interaction with the environment. It is therefore necessary for teachers or educators to know how attitudes can be changed and inculcated in learners.

In his studies, Thorndike (1932) showed that attitude development depends upon the surrounding conditions of an individual. Attitude will change positively if the conditions are favourable or negatively if they are unfavourable. Its development is also influenced by practice, readiness and effect on the part of the learners.

The current study set out to investigate the relationship that exists between student attitude and their performance in the area. In relation to attitude development and change, attitudes develop as one develops a perception and continues to interact with the environment. They change depending on the prevailing conditions. Therefore in relation to the study, if the learner develops a negative opinion towards chemistry, the chances of performing better are minimal since there is nothing good that is motivating the learner to work hard in the area. This in turn leads to poor achievement. When the learners develop favourable feelings towards the subject, they dedicate much of their time in studying the subject and this also leads to better performance in the area.

2.3 Gender difference in attitude and achievement in chemistry

The development of knowledge and skills in the area of science is becoming necessary for all students. The scientific skills are important for individual and the nation to enable it to compete in the global market.

Moffat (1992) found that gender difference in attitude towards science existed in the education process. This is observed in differential course enrolment. Hardesty (1992) also noticed that there were lower female science achievement scores and fewer females in science achievement scores and in related careers. Fewer female students than male are choosing to take elective science classes.

Investigations have been reported on differences and similarities between boys and girls concerning perception and attitude towards science and achievement in sciences. According to Fensham (1980) physical science is perceived as being tough, hard and analytical. This leads to the development of the image that science is more masculine. He adds that this is reflected in teachers and students way of participation.

Kull (1982) designed and carried out a study to determine the impact of student attitudes towards sciences. The sample size constituted of 450 eighth grade students in New York Junior High School. These students were presented and post tested in their scientific attitude for the results. Positive attitude for most of the students were observed. Further it was noted that there was greater interest in science for boys than girls.

Akinmade (1982) focused on perception and attitude of high school students towards science courses in sub-urban school of Michigan. The sample size was 217 ninth grade students. From the findings of the study boys were significantly more interested in manipulation of laboratory equipment and materials than the girls.

In a study of secondary and college students selected from 7 state secondary schools and one federal college in Nigeria, Aghenta (1989) found that perceived difficulties of science occupations was a significant factor in preventing girls from entering scientific fields.

Lee and Lockheed (1990) conducted a study on perceived ability and gender difference in achievement in sciences. A total of 1012 students enrolled in a single-sex and mixed-sex secondary schools from ten Southern States in Nigeria. From the studies they found that perceived ability positively related to higher achievement in a subject and this was more in male students compared to the female students.

The attitude that one holds towards a subject appears to be a powerful predictor of achievement in the respective fields. A prior positive attitude towards a subject, the development of a positive attitude towards a subject by a teacher or a strong positive attitude towards science all appear to play a critical role in whether a girl will persist or drop out the scientific pipeline(Mordi, 1991).

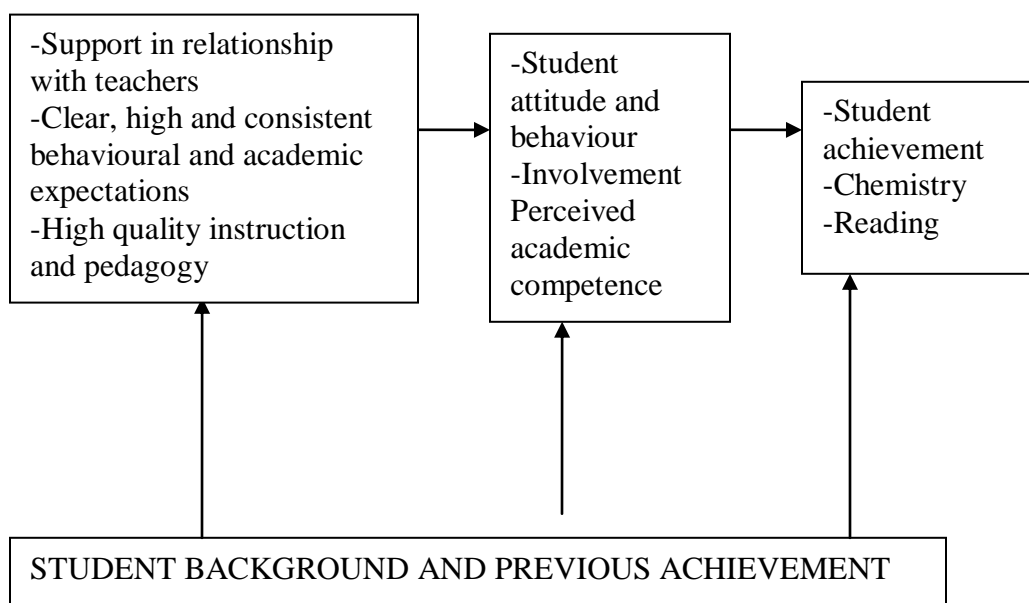
Thus from this literature reviewed, there is a possibility of having positive correlation between attitude towards chemistry and achievement in the subject. There also exists

gender difference in attitude towards science and this directly impacts achievement in the area.

2.4 Achievement in school

Student's attitude is an integral part of learning. It influences one's behaviour, inner mood and therefore learning. Both positive and negative attitude have a strong impact on the success of a subject learnt (Mordi, 1991). The attitude of an individual depends heavily upon different stimuli as shown in figure 2.1.

Figure 2.1: Theoretical stimuli model



Source: Mordi (1991)

From figure 2.1, the student's background characteristics and their levels of prior achievement influence their subsequent achievement, attitudes, behaviour and perceptions of the school context. Therefore students' involvement in their studies is seen as the level of participation and intrinsic interest that a student shows in school. This

involves both behaviours such as persistence, effort, attention etc and attitudes such as motivation, positive learning values, enthusiasm, interest, pride in success and many others (Connel and Wellborn 1991). Therefore, engaged students or active students seek out activities inside and outside the classroom that lead to success in their learning. They display curiosity, adhesive to know more and positive emotional responses to learning and hence positive attitude towards the area of study.

The degree to which students feel competent and confident of their ability to be successful is an important factor in any learning environment. The students who are convinced that they lack the ability to succeed or control the outcome of their educational experience will not make an effort to excel in school-related work (Connel and Wellborn 1991).

To become successful, students need to know what it takes to succeed and believe they can succeed given what they know. Thus students who do not think they can complete assigned homework successfully, or who don't think they will be able to pass the course needed to graduate are unlikely to do much and may end up performing poorly in class or even drop out of school.

Students' beliefs about their competence and their expectations for success in school have a direct linkage to their levels of involvement as well as their emotional states that promote or interfere with their ability to be academically successful (Connel and Wellborn, 1991). Incompetent students fear that educational interactions will result in embarrassment and humiliation, and this in turn inhibits them from behaving in ways that

might help them such as asking questions for better clarification where they are confused or engage in trial- and –error problem solving. Such students will avoid putting much effort into a task so that they can offer a plausible alternative to low ability or lack of knowledge as an explanation for failure.

Research conducted by the National Research Council (2003) indicated that some variables such as positive self image , self-motivation and other factors in the educational context are important in supporting and sustaining positive academic self perceptions and engagement in school. Relationship between students and teachers and the climate in the classroom are positively associated with the levels of attitude and general performance of the student.

Challenging learning environment has been linked to student involvement in tasks and perceived competence .High, clear and consistent expectations also support the students' confidence and hence better performance in an area (Gambone, Adena, Theresa and Cynthia, 2004). To motivate students however, standards and expectations must be clear and genuinely achievable. Students are motivated to work hard when goals are set at an appropriate level. This in turn makes them to be motivated towards achieving the goal and hence a positive attitude towards the area.

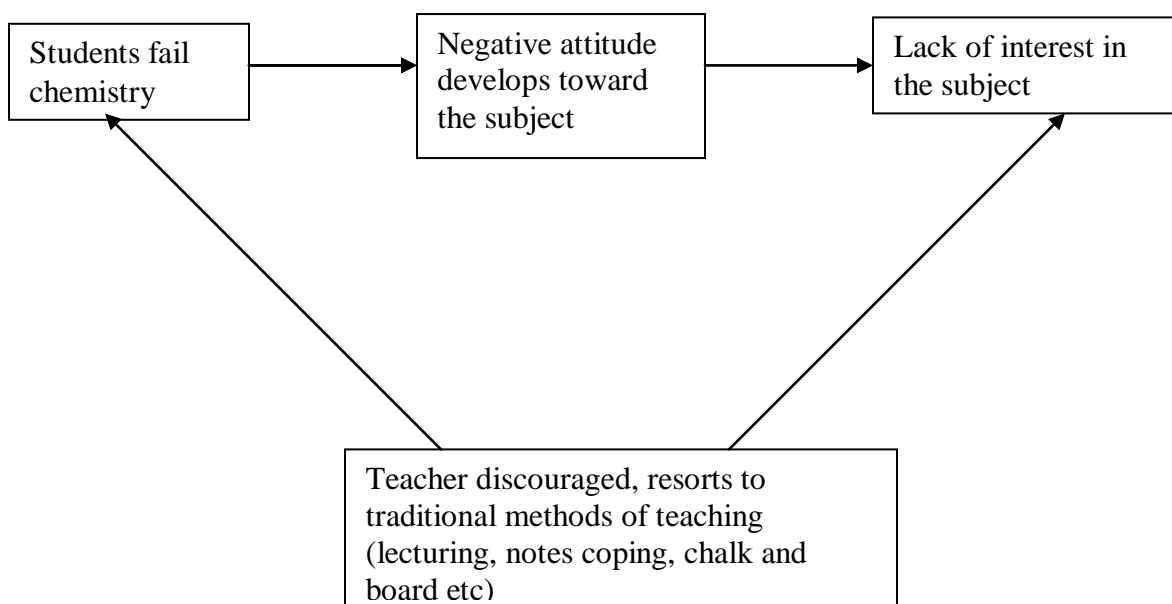
In a meaningful and challenging educational environment, students become cognitively involved when teachers ask them to wrestle with new concepts, explain their reasoning defend their conclusions, or explore alternative strategies and solutions.

Collaboration among peers-students working together in pairs or small groups to help one another learn- also has been associated with increased engagement and learning which in

turn results to better achievement in schools(Davidson 1999). When students put their heads together rather than working in isolation, they are more receptive to challenging problems and chances of getting a solution are high. This further motivates them and as a result they are likely to develop a positive attitude towards the subject and spend more time in studying along that area.

When students work alone and fail to attain the expectations, this leads to lack of interest and a development of negative attitude in the subject and thus affects the teaching and learning of the subject (Aremu, 1998). This relationship is illustrated in figure 2.2.

Figure 2.2: An illustration of factors affecting the teaching and learning of chemistry



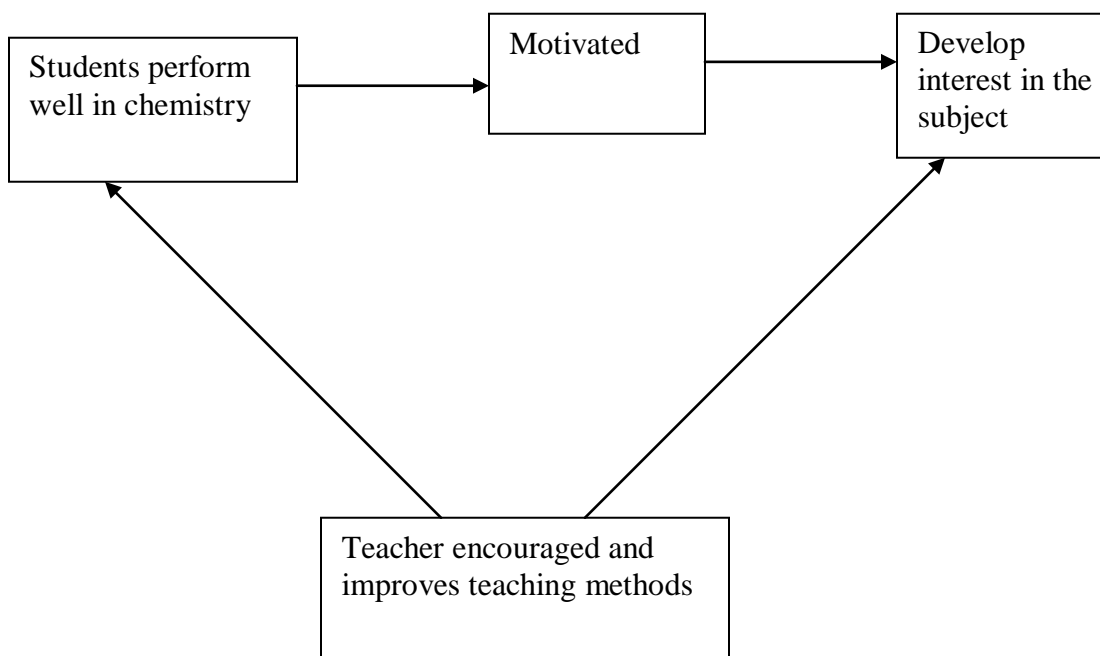
Source :Aremu (1998)

When pupils express lack of interest in the subject, it may affect the way they react or listen to the teacher. When many believe that they can not pass, the teacher may also be

affected. This is because a part from these negative responses from the students; he/she is as well being confronted by a lot of other challenges (e.g. low income, low status in society, large teacher-student ratio) and so on. This may cause him or her to resort to the easiest way of disseminating knowledge that is “chalk and talk” without use of instructional materials. He may not also bother to vary his teaching styles to suit individual; therefore the cycle goes on. One unfortunate outcome of this is that, the negative attitude towards the subject is passed down from one generation peer group to another and therefore the cycle keeps enlarging.

When students therefore express lack of interest in a subject, it affects the way they react or listen to the teacher. Interest and attitude of a learner towards a particular subject therefore matter a lot. This is because these two constructs are highly motivating factors which can lead to better achievement on the part of the learner.

On the other hand, when the students perform well in the subject, they get motivated by the outcomes (Aremu, 1998). This makes them to develop a positive interest towards the subject. Hence they will seek to know more from their teachers or instructors. This relationship is illustrated in figure 2.3.

Figure 2.3: Relationship between learner, teacher and subject

Source: Aremu (1998)

Hence through good performance, the teachers are also encouraged to work hard in terms looking for more resources that enrich the students' study content and even change their teaching methods and techniques to ensure that students score high in the subject.

Therefore good attitude or positive attitude and better interest learners display particularly in chemistry serve as an encouragement even to the teacher. This in turn helps the teacher to disseminate knowledge to the best of his/her ability making use of all available resources rather than resorting to the use of chalk and talk when learners show no interest or negative attitude (Mordi, 1991)

Equally school achievement bears a direct relationship to occupational achievement (International Labour Office, 1972). Consequently, parents do not like their children to drop out at lower levels of education for fear that they would not get good jobs (Ndonga, 1999). Good performance therefore in chemistry and other science-related subjects has been encouraged very much because they get ways to many careers and professional qualifications (Republic of Kenya, 1985).

Achievement in school has a direct bearing on the attitude a student is likely to develop at the end of the day. Good performance is a motivation on its own in a sense that the learners who perform well are motivated to work hard in the area and if they perform poorly, they tend to withdraw their efforts from studying the subject. This in turn leads to the development of a negative feeling towards the subject. Therefore good performance in school is important as this will enable the cultivation of a positive attitude towards the area of study amongst the learners.

2.5 Conclusion

From these studies, the students' feelings towards and their achievement in a subject reveals a relationship. Attitude develops as one develops a perception and it changes as one interacts with the environment. The attitude differs between the sexes at the same level. Achievement in school will determine whether one will have a positive or negative attitude towards the subject. Therefore it is evident that the teaching of chemistry may be improved in terms of approach by use of various teaching methods and resources. Attitude as a psychological factor (or problem) may also contribute towards achievement

in chemistry. Hence the need for the current study to investigate the relationship between the students' attitude and achievement in this subject.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

This chapter is mainly concerned with the description of the research methodology that the researcher used during the research process. The chapter describes the design and the population from which the sample was drawn. The instrument for data collection, administration of the tools and the mode of data analysis are outlined.

3.1 Research Design

Ex post facto design was adopted for this study. This design was used because there was no manipulation of variables as the phenomenon under investigation had already taken

place. Furthermore academic achievement is affected by a multiplicity of factors making it impossible to directly control all the independent variables that are likely to confound the findings (i.e. the independent variables were attitude towards chemistry, type of school and gender). The researcher was therefore concerned with the situation as it is.

Data was obtained from form four students. Their chemistry attitude scale scores and KNEC results were used to establish the relationship that exists between the two variables (that is attitude and achievement) in chemistry. The inferences made were generalized to the entire population of form four students in Central Kisii District.

3.2 Site of the study

The study was carried out in Central Kisii District, Nyanza Province; Kenya. The district is bordered by Nyamira district to the North, Gucha district to the South, Migori district to the South west, Rachuonyo district to the West, and Homabay district to the North West. The district is on a bearing of 002° south of the equator, 035° east, 002° north and 015° west. The map of national location of the area under study is in appendix C.

The main features in the district are the Kisii highlands. The highlands are of volcanic origin and they determine the relief, climate and soils and therefore the agricultural potential of the district. The Kisiiis are mainly agriculturalists and their staple food crops are bananas, maize and sweet potatoes. Tea is widely grown and forms their cash crop. They also keep livestock in small scale.

Within the, district most people are self employed through Jua kali firms and farming. There are no industries within the district apart from a small Coca Cola industry. The

means of communication are poor in most places and the standards of living for most families are poor.

The study was carried out in Kisii central district to establish the cause(s) of dismal performance in the subject. The site was also chosen because no research of this nature has been conducted within the district despite the perennial poor performance in K.C.S.E chemistry results.

3.3 Research population

The district has 85 secondary schools. There are 48 provincial schools, 28 district schools and 9 private schools. Among these schools, there are 5 boy schools, 4 girl schools and 76 co –educational (mixed) schools. The district has a student population of 24924. There were 17198 students from mixed secondary schools, 3082 students from single girl schools and 4644 students from single boy schools. Categorically provincial schools had a population of 14302 students, district schools had 6831 students and private schools had 3791 students. Out of this population, only form four students were considered. The total number of form four students was 6173 but of this only 6150 were chemistry students.

3.4 Sample size

The choosing of schools within the district was based on accessibility due to financial constraint and time factor. The sample schools constitute all categories of schools within the district that is Provincial, District and Private schools. The reason for studying all the

sample schools was to establish whether attitude as a factor affects all students regardless of the category of school they are admitted in. Only four chemistry students constituted the sample.

The sample secondary schools were 30 with 16 provincial schools, 10 district schools and 4 private schools. Out of the 30 sample schools, 4 were boy schools, 3 were girl schools and 23 were mixed schools. The total number of students sampled within the district was 1172. The total number of students sampled from provincial schools was 740. This was 63.1% of the total sample. There were 320 from district school forming 27.3%, and 112 from private schools which was 9.6%. From the single boys school, only 129 students were selected and this constituted 11.01% of the total sampled students, from the single girls school 99 students were selected and this was 8.45% of the sampled population, and from the mixed schools 944 students were sampled and this made 80.54% of the sampled population. This gave a sample of 1172.

The total number of male students was 712 and this made 60.75% of the students sampled. The total number of girls was 460 making 39.25% of the sampled students. This also gave a total sample of 1172 students. According to Cohen and Manion (1994) the sample size of 30% of the population is considered minimum. Only 1172 students constituted the sample for the study. This sample was considered due to resources and time limitation.

Form four students were chosen because the researcher assumed that they have covered sufficient content of secondary school chemistry than any other form and therefore they may have developed stable attitude towards the subject. Equally only form fours were considered since the researcher found that there was mass student migration within the schools in the district for the lower classes that is form one and two. It was therefore necessary to consider form four since by this time; the students are officially registered with the Kenya National Examination Council and therefore their nomadic behaviour curtailed.

3.5 Sampling

. The schools of the area under study are categorised as; Provincial schools, District and Private Schools. The study targeted a representative number of all categories of secondary schools within the district. Form four students constituted the sample for the study.

In developing a sampling frame for the study, the schools within the district were stratified and schools from each category were then selected randomly by use of random tables. Following this method, the names of all schools in the given category were written and assigned numbers. The researcher used random number tables to select the number of schools required in each category. In the single sex school, 99 of the girls and 129 of the boys were selected. From the mixed schools a total of 944 students were selected. To obtain this the researcher selected the students by use of random number tables. For the co-educational schools, clustering into boys and girls was done to ensure equal

proportion of both sexes in the sample. The subjects were then chosen from each cluster by use of random number tables. The sampling grid is as shown in table 2.

Table 2: Sampling grid for Central Kisii District secondary schools

Category of school	Number of schools	Sample schools	Number of students
Provincial	48	16	740
District	28	10	320
Private	9	4	112
Total	85	30	1172

3.6 Variables for the study

According to Orodho (2005), a variable is an empirical property that is capable of taking two or more values. Variables are of two types namely the independent and dependent variable. Both variables are tied to one another by a certain relationship

Independent variable: This is that factor which is manipulated or selected by the researcher to determine its relationship to an observed phenomenon, which constitutes dependent variable. The variation or different values taken by the independent variable is that factor which is observed and measured to determine the effect of the independent variable on the dependent variable, a variable which is manipulated by the researcher. In this study the independent variable were attitude towards chemistry, type of school and gender.

Dependent variable: This is a variable which is measured (rather than manipulated). It is subject to the influence of the independent variable. For this case the dependent variable was academic achievement in chemistry. This was measured by use of end of course results obtained from the Kenya National Examination Council and a criterion based on scores obtained from a Five- Likert scale. Here a student who had a score range of 74-

100 was taken to be having positive attitude towards chemistry. Those who scored 48-73 were taken as having a neutral attitude because they are not sure of themselves. Those with 47 and below were taken as having negative attitude towards the subject and hence would achieve less in chemistry.

3.7 Research instruments

The researcher used the student attitude scale. This was a questionnaire with 20 items where the respondent was to give his or her response as either strongly agree, agree, not sure, disagree or strongly disagree (appendix A). These comments were then scored to establish the attitude held by the student towards chemistry. According to Kindred (1976), the use of questionnaire in measuring the public opinion either from the school's personnel or the community member's side is one of the most appropriate methods. It also has the advantage of collecting information from many respondents within a limited time and the respondent are also free to offer information because they re assured of their .anonymity.

An attitude scale questionnaire with a five point Likert scale was used to solicit student's feelings and opinion about chemistry. It consisted of twenty items. These items were arranged in an order, which was meant to introduce an in- built check for serious and genuine responses about chemistry.

3.8 Development of the instrument

An instrument is a device meant to initiate responses from respondents or subjects, which serve as data for the study. It may include; a written examination, a questionnaire, an interview schedule, an observation schedule etc.

In this study, data was collected by means of questionnaires (appendix A). The questionnaires were used because of their ability to sample a large number of respondents within a short period of time. In order to consider the kind of attitude held by students a questionnaire was designed to establish the feeling of students towards chemistry. This was done by borrowing and modifying attitude items from questionnaire utilized by Njuguna (1998). Njuguna had used these questionnaires to establish the attitude of form four students towards science subjects in Kigumo division, central Province Kenya.

Twenty items were selected and they were designed to measure attitude towards chemistry practical work, attitude towards chemistry outside class, attitude towards self involvement in chemistry related activities and attitude towards self-motivation for further pursuits in chemistry.

The questionnaire made a provision for the indication of whether the student was a male or a female. Information about questionnaire assured the students that their responses were treated with utmost confidentiality. Therefore they were only required to write their admission numbers and not names.

Academic achievement was measured by use of the end of course exams. The scores were obtained from the records provided by the Kenya National Examination Council. They were correlated with the scores obtained from the attitude scale to establish if there is any relationship between the two variables.

3.9 Reliability and validity of the questionnaire

For any research instrument to qualify as a research tool, its reliability and validity must be established before the tools are taken to the field for the purpose of data collection.

Reliability

Reliability refers to the degree of consistency of scores obtained by the same individual when examined with the same test on different occasions. The greater the degree of consistency in an instrument, the greater is its reliability. Therefore a scale or a test is reliable to the extent that repeated measurements obtained using it under constant conditions will give the same results (Ranjit, 1999).

In order to determine reliability of the attitude scale (questionnaire) a test retest method was used to establish whether the responses given first corresponds to those of the second time. The questionnaires were administered to the same students used in the pilot study within an interval of two weeks. The students used in the pilot study were from a mixed school outside the sample school to ensure the presentation of both sexes. The Pearson Product Moment Correlation coefficients (r) between the two set of scores of the responses from the questionnaires administered on the two different occasions were used to calculate the reliability coefficient.

If ' r ' is positive, then there is a positive correlation implying that the instrument is reliable and vice versa. On the other hand if ' r ' is zero, then there is no correlation implying that the instrument should be modified or the items changed. If negative it implies that there is a negative correlation. For this study, ' r ' value was 0.7 and this was considered reliable.

Validity

Validity is the extent to which a research instrument performs what it was designed to do. To ensure content validity, the questionnaire was given to the experts and students from the department of educational psychology of Moi University who examined the items

critically and passed on their comments to the researcher. The researcher then modified the items using the suggestions put forward by the said respondents. Equally a sample of the questionnaire was given to some students outside the sample schools to answer them. From their scores of items, the researcher was able to know whether the content in the questionnaire was valid. Necessary adjustments were then made. It was necessary to have items critically analyzed by a number of people to improve the validity of the research instrument.

3.10 Administration of the instrument

A research permit was obtained from the National Council for Science and Technology (appendix D) to enable the researcher to collect data from various schools and education office from the district. The researcher obtained permission from the heads of the secondary schools selected for the study. The questionnaires were then given the selected students by the help of the chemistry teachers. The students were then asked to write down their gender by just indicating whether male or female as this would help to trace the attitudes of each sex towards chemistry. The students were to answer the questionnaire and return them immediately to the subject teacher who in turn handed them to the investigator. This was done so as to avoid discussion amongst the learners which might lead to change of opinion.

Concerning the achievement scores no instrument was administered but scores were obtained from the Kenya National Examination Council for end of the chemistry course. This was because the investigator was out to obtain scores from a standard test for all the

sample schools at the end of the entire course so that no students from any schools might be disadvantaged due to variability in item construction.

3.11 Scoring of the instrument

Students' attitudes were evaluated on a 5- point Likert scale (strongly agrees, agree, undecided, disagree, and strongly disagree). Scoring of the items by students in favour of chemistry was: strongly agree-5 marks, agree-4 marks, undecided-3 marks, disagree-2 marks and strongly disagree-1 mark. For the students not in favour of chemistry; strongly agree-1 mark, agree-2 marks, undecided-3 marks, disagree-4 marks, and strongly disagree-5 marks. For each item, the responses were categorised as positive if the score was in the range of 3.7-5.0, neutral if in the range of 2.4-3.6 and negative if 2.3 and below.

The researcher obtained the total attitude score for each student by adding scores of all items together. A student was considered as having positive attitude if they scored 74 marks and above, those with 48-73 marks were considered neutral and those with 47 marks and below were considered as having negative or unfavourable attitude.

Academic achievement scores for the students were directly obtained from the records of the Kenya National Examination council. Students who had a mean score of 9.0 and above were considered as having high performance in chemistry. Those who had a mean scored range of 5.0 – 8.0 were considered average. Those with a mean score of 4 and below were considered as having low performance in chemistry. The grading system is as in table 3.2.

Table 3.2: Grading system based on the points scored in KNEC exams

Grading system	Points awarded
A	12
A-	11
B+	10
B	9
B-	8
C+	7
C	6
C-	5
D+	4
D	3
D-	2
E	1

3.12 Data analysis

The results obtained were then analysed by use of both descriptive and inferential statistics by Statistical Package for Social Sciences (SPSS) program. From the analysis, the researcher was able to discuss the findings, make conclusions and suggest any recommendations for future related researches. The statistical techniques used were mean, variance, Pearson product moment correlation coefficient(r), percentages, chi-square and t-test.

Mean

Mean is one of the measures of central tendency. It indicates the most representative score in a set of observations. Basing data on normal distribution, mean is the most stable measure of central tendency.

Variance

This is a measure of dispersion. It was used to enable the researcher to determine the homogeneity of the population from which the samples were drawn. Variance therefore shows how scores vary.

The Pearson Product Moment Correlation Coefficient (r)

Is a technique that determines the extent of association between two variables. It also reflects the direction and magnitude of the relationship between the variables. The correlations may be positive where an increase on one variable means an increase on the other variable. The correlation is negative where an increase on one variable means a decrease on the other; or may be zero meaning that the two variables are independent of each other. The relationship ranges from perfect positive (+1.00) to perfect negative (-1.00). It was used in the study to give association between the variables being studied.

The chi-square(X^2)

This is a non parametric statistical test. It is used to analyse data that is in the form of frequencies, percentages, proportions and percentiles. It also tests hypotheses about associations (relationships) i.e. how two or more variables are related to each other. It was used by the researcher since the data was in percentages and wanted to establish relationship that existed between the variable under study.

Percentages (%)

Are proportions expressed out of 100. They give a proportion of the total. They were used by the investigator to establish the proportion of the subjects in various areas of the study samples and their responses.

t-test

This was used to find out if the relationship between the variables in Pearson Moment Correlation Coefficient is significant or not. It was relevant in this study since two variables were considered i.e. attitude and academic achievement) at ago 'r' derived for which the significance had to be tested. If the calculated value of 'r' happens to be equal to or greater than the tabulated value, then the relationship is considered significant and vice versa.

The significance of t-test and the chi-square were tested at alpha level 0.05 or 95% confidence level.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND DISCUSSION OF THE FINDINGS

4.0 Introduction

This chapter is concerned with the presentation of data and its analysis. The questionnaire items were first analysed descriptively and inferentially. The results were presented on tables. The rest of the data was then analysed and results obtained presented using tables and charts. The analysis of data was done in the light of the objectives and or research hypotheses.

4.1 Students' attitude towards chemistry and their academic performance

One of the questions the study was out to answer was "What is the relationship between the students' attitude towards chemistry and their achievement in the subject?" The attitude held by secondary school students towards chemistry was analysed using the responses of the participants to the individual items in the questionnaire. The data is presented in the following tables.

Table 4.1: Summary statistics of students' responses to the questionnaire items

Item no.	Item	N	Mean	Std deviation
1	Enjoy chemistry	1172	3.29	1.146
2	Work in chemistry	1172	3.08	1.082
3	Understanding chem.. in private study	1172	2.81	1.118
4	Easy access to teacher for help	1171	3.38	1.323
5	Frequency of idleness	1172	4.00	1.054
6	Understanding of chem.. concepts	1172	2.97	0.911
7	Feeling on performance in chemistry			
8	Like studying chemistry than other subjects	1172	2.80	1.123
9	Hate chemistry	1172	3.63	1.186
10	Feeling about doing chemistry Practicals	1172	2.46	.983
11	Chemistry is difficult to understand	1172	3.13	1.350
12	I can not understand chemistry	1172	3.42	1.335
13	I try to do the very best in chemistry	1172	1.93	.933
14	Can do without chemistry	1172	3.41	1.317
15	Chemistry is useful in life	1172	3.89	1.352
16	Would not choose chemistry/related careers	1172	3.63	1.329

17	Chemistry lessons are boring	1172	3.94	1.224
18	Wish I would do better in chemistry	1172	4.61	.732
19	Feeling about assignments and homework	1172	2.69	1.059
20	Do not like chemistry examinations, Assignments and homework	1172	3.40	1.334
	Total score	1172	64.59	10.826
	Valid N(list wise)	1172		

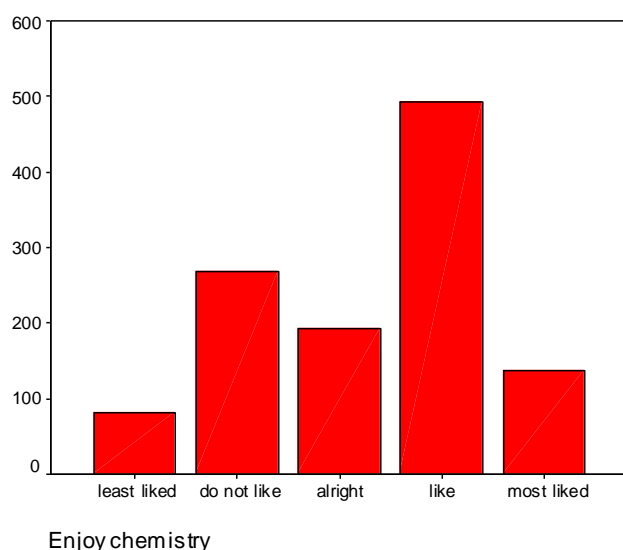
From table 4.1, a total of 1172 students gave responses to the 20 items of the questionnaire. The mean and the standard deviation of each and every item were given as shown in the table. The item with the highest mean was that with a score of 4.61 which states that “I wish I would do better in chemistry”, while the one with the lowest mean is that with a score of 1.93 which states that “I try to do the very best in chemistry”. This gave a mean difference of 2.68.

Table 4.2: Frequency table on enjoyment of chemistry

		Frequency	Percent
Valid	least liked	81	7.0
	do not like	268	23.0
	alright	193	16.0
	like	492	42.0
	most liked	138	12.0
	Total	1172	100.0

From table 4.2, a total of 349 students do not like the subject while 630 like it. The rest 16% are neutral. This respondent feeling is presented in figure 4.1.

Figure 4.1: A bar chart on enjoyment of chemistry



From figure 4.1 (the bar graph), the highest number of students just like chemistry. This is followed by those who don't like the subject. Those who like it least form the least frequency.

Table 4.3 shows frequencies and percentages based on the work in chemistry.

Table 4.3: Student feelings towards the work in chemistry

		Frequency	Percent
Valid	most difficult	60	5.0
	quite difficult	368	31.0
	right level	256	22.0
	fairly easy	394	34.0
	very easy	94	8.0
	Total	1172	100.0

From table 4.3, only 36% of the students find the work in chemistry to be difficult while 42% find it fairly easy; and 22% find it to be at the right level.

Also table 4.4 gives a break down on how easy it is to understand chemistry in private study.

Table 4.4: Understanding of chemistry in private studies

	Frequency	Percent
Valid most difficult	106	9.0
quite difficult	477	41.0
right level	192	16.0
fairly easy	328	28.0
very easy	69	6.0
Total	1172	100.0

A total of 49% of the students which constitutes 583 of the sampled form fours find it difficult to understand chemistry during their private study. This implies that it is difficult for them to study alone and hence have to depend upon the teachers. In his/her absence, no studies take place.

Tables 4.5 (a) and (b), gives data on the feelings about evaluation of the subject in terms of assignments and exams.

Table 4.5 (a): Student feeling about chemistry assignments

	Frequency	Percent
Valid always difficult	73	6.0
sometimes difficult	594	51.0
alright	218	19.0
fairly easy	202	17.0
very easy	85	7.0
Total	1172	100.0

(b) Student feelings about chemistry exams

	Frequency	Percent
Valid strongly agree	130	11.0
agree	259	22.0
do not know	50	4.0
disagree	480	41.0
strongly disagree	253	22.0
Total	1172	100.0

From table 4.5 (a) 57% of the total number of sampled students finds the assignment to be very difficult. This is true from the fact that a large percentage of the students find it difficult to study the subject on their own. Therefore even doing assignment alone will indeed be difficult. Though 63% like chemistry exams, they will not achieve much since they can not study alone and do assignments on their own. This may result to poor performance and demotivation and hence development of negative attitude towards the subject.

Table 4.6 provides data on how easy it is to get access to the teacher for any assistance.

Table 4.6: Student access to teachers

	Frequency	Percent
Valid most difficult	70	6.0
quite difficult	360	31.0
right level	118	10.0
fairly easy	307	26.0
very easy	317	27.0
Total	1172	100.0

From table 4.6 it is evident that almost half of the students find it difficult to get teachers to consult when need arise. This means that they can not be able to continue with their

studies since none seems to be at their disposal. From table 4.7, the total number of students who do not understand chemistry related concepts were 33% while those who understand them well are 27%.

Table 4.7: Student understanding of the meaning of concepts and terms in chemistry

	Frequency	Percent
Valid not at all	31	3.0
not well	352	30.0
fairly well	467	40.0
quite well	264	23.0
very well	58	4.0
Total	1172	100.0

This therefore implies that the performance of the students is not very good since there is poor understanding of what they are dealing with. That is why in table 4.8, a total of 73.7% of the students are not happy with their performance in chemistry.

Table 4.8: Student feeling on performance in chemistry

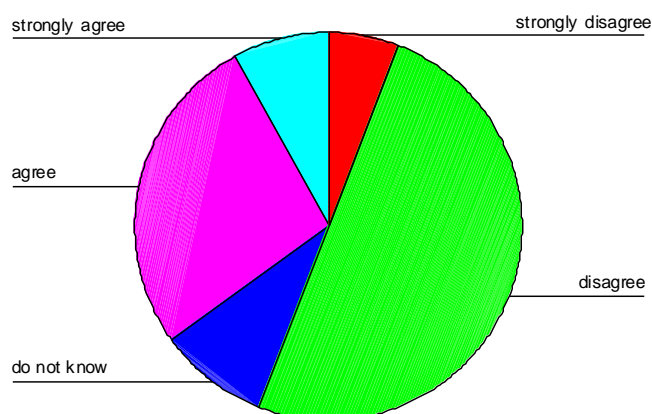
	Frequency	Percent
Valid disappointed	356	30.4
not happy	507	43.3
satisfactory	119	10.2
quite happy	153	13.1
very happy	37	3.0
Total	1172	100.0

Only 16.3% are happy with their performance in the subject. The remaining 10.2% are not sure of their performance.

Table4.9: Chemistry as the most studied subject

		Frequency	Percent
Valid	strongly disagree	70	6.0
	disagree	591	50.4
	do not know	99	8.4
	agree	331	28.3
	strongly agree	81	6.9
	Total	1172	100.0

From table 4.9, a total of 56.4% of the students do not like studying chemistry compared to the other subjects. Only 35.2% of the entire sample like studying chemistry compared to other subjects. The remaining 8.4% are not aware or they do not know the subject they like studying most. This is presented in figure 4.2.

Figure 4.2: Chemistry as the most studied subject

From figure 4.2, the highest percentage of students agrees that they don't take much of their time in studying chemistry.

It is evident therefore that the students are not motivated by the scores they get in chemistry. Thus they need not to waste much of their time in an area which they do not perform well. This also shows the poor attitude the students hold towards chemistry.

Table 4.10 provides data based on the feeling of students about chemistry practicals.

Table 4.10: Student feeling about chemistry practical

	Frequency	Percent
Valid always difficult	139	12.0
quite difficult	600	51.0
alright	232	20.0
fairly easy	161	14.0
very easy	40	3.0
Total	1172	100.0

From table 4.10, a total of 63.% of the sampled students find chemistry practicals to be difficult. Since chemistry is a practical oriented subject, then the students will achieve less at the end .This is likely also to affect their motivation towards the subject and hence may lead to the development of negative attitude towards the subject.

Table 4.11 provides data on the utility of the subject.

Table 4.11: Utility of chemistry

	Frequency	Percent
Valid strongly disagree	152	13.0
disagree	66	5.6
do not know	33	2.8
agree	432	36.9
strongly agree	489	41.7
Total	1172	100.0

A total of 78.6% of the students (table 4.11) agree that chemistry is useful in life. However this is not supported by the data in table 4.12 where a total of 64.2 % of the students agree that they could not like to choose chemistry related careers. This is because they find it difficult to understand concepts and terms used in the subject and at the same time the practicals are difficult to perform such that it makes the entire course to be difficult and boring. Therefore despite the utility of the subject, they do not anticipate to take chemistry related areas as future careers.

Table 4.12: Student wish to choose chemistry related careers

	Frequency	Percent
Valid strongly agree	130	11.1
agree	131	11.2
do not know	158	13.5
disagree	377	32.2
strongly disagree	376	32.0
Total	1172	100.0

Equally the students have a desire to do better in the subject since they are aware of its utility. This is evident from table 4.13 where 95.9% of the sampled students agree with the statement “I wish would do better in chemistry”.

Table 4.13: Student desire to perform in chemistry

	Frequency	Percent
Valid strongly disagree	14	1.2
disagree	28	2.4
do not know	6	.5
agree	307	26.2
strongly agree	817	69.7
Total	1172	100.0

Despite the fact that the students yearn to do better in chemistry since they understand the importance of chemistry as a subject that cuts across all sciences, the students disagree with the statement that they do the very best in chemistry as shown in table 4.14

Table 4.14: “I try to do the very best in chemistry”

	Frequency	Percent
Valid strongly disagree	399	34.0
disagree	590	50.0
do not know	59	5.0
agree	110	10.0
strongly agree	14	1.0
Total	1172	100.0

From table 4.14, only 10.7% of the students agree that they do the very best in chemistry.

On the other hand, 84.3% do not agree meaning that their performance is always poor.

Table 4.15 provides data where 35% of the students feel that they can do without chemistry despite its utility in one’s life. This equally contributes to their dismal performance in chemistry and consequently results to the development of unfavorable attitude towards the subject.

Table 4.15: Students can do without chemistry

	Frequency	Percent
Valid strongly agree	83	7.0
agree	335	28.0
do not know	61	5.0
disagree	404	35.0
strongly disagree	289	25.0
Total	1172	100.0

A correlation test between the understanding of chemistry and how boring the subject is was performed at 0.05 level of significance as presented in table 4.16. This gave an 'r' value of 0.514 which was a positive correlation implying that when the students do not understand the subject, it becomes very boring and hence they are likely to switch off. This in turn affect their performance negatively since very little is gained during the learning process.

Table 4.16: Correlation between difficulty of chemistry and the boring of the subject

		Chemistry is difficult to understand	Chemistry lessons are boring
Chemistry is difficult to understand	Pearson Correlation	1	.514**
	Sig. (2-tailed)	.	.000
	N	1172	1172
Chemistry lessons are boring	Pearson Correlation	.514**	1
	Sig. (2-tailed)	.000	.
	N	1172	1172

The total scores from the items responded to were also used to indicate the likely relationship between students' attitude towards chemistry and their academic performance in the subject. From table 4.17, the analysis of the total scores against how much the students hate the subject gave an 'r' value of 0.672. This was a strong positive relationship implying that the more the students hate the subject the more they perform poor and the more they like the subject the more they score high since they are motivated by the scores attained.

Table 4.17: Correlation between student hate chemistry and total scores

		Hate chemistry	Total score
Hate	Pearson	1	.672

chemistry	Correlation		
	Sig. (2-tailed)	.	.000
	N	1172	1172
Total score	Pearson Correlation	.672	1
	Sig. (2-tailed)	.000	.
	N	1172	1172

The average response was 64.59. This was an implication of neutral decision as far as chemistry is concerned and may also account greatly for the poor performance in chemistry. This is supported by the fact that the entire district mean scores are very poor and have remained in this state for quite some time. Therefore there is a direct relationship between the students' attitude towards chemistry and their performance in the subject.

4.2 Influence of the type of school on students' attitude towards chemistry

The second research question to be investigated was "Is there a difference in attitude towards chemistry between students from single and mixed sex schools?" The school types that were under study were single boy schools, single girl schools and mixed schools or mixed sex schools. Mixed schools dominate in the district followed by single boys' schools and lastly single girls' schools. The three types were studied in order to establish if there might be a difference in the attitude held towards chemistry and how it may influence academic performance in chemistry. Table 4.18 gives a summary of the school types, the no of students sampled from each type, the chemistry KNEC mean score for the year 2008 and the total item scores.

Table 4.18: Type of schools and their chemistry mean scores in KNEC exams (2008)

Type of school	No. of students	KNEC mean score	Attitude mean score
Boys	129	4.423 (D+)	72

Girls	99	3.754 (D+)	64
Mixed	944	5.245 (C-)	70

From table 4.18, the KNEC mean score of the mixed schools was slightly high compared to that of the single sex schools. On the other hand, the mean score for boy schools is higher compared to that of the single girl schools.

A cross tabulation was performed to compare the feeling on performance between the three types of schools and the results were tabulated on table 4.19 as follows.

Table 4.19: Feeling on performance in chemistry cross tabulation

			Feeling on performance in chemistry					Total
			disappointed	not happy	satisfactory	quite happy	very happy	
School type	Boys school	Count	51	48	12	12	6	129
		% within School type	39.5%	37.2%	9.3%	9.3%	4.7%	100.0%
	Girls school	Count	45	42	3	9		99
		% within School type	45.5%	42.4%	3.0%	9.1%		100.0%
	Mixed school	Count	260	417	104	132	31	944
		% within School type	27.5%	44.2%	11.0%	14.0%	3.3%	100.0%
Total	Count	356	507	119	153	37	1172	
	% within School type	30.4%	43.3%	10.2%	13.1%	3.2%	100.0%	

From table 4.19, a total of 76.7% of the boys from single boys schools are disappointed with their performance, 87.9% from single girls' schools and 71.7% were disappointed from mixed schools. From this trend, though the mixed schools tend to perform better, followed by single boys' schools and lastly single girls' schools, the difference is small. Therefore the type of school may slightly influence the type of attitude held towards chemistry and the general performance in the subject.

4.3 Influence of gender on students' attitudes towards chemistry

The third research question to be answered was “What is the relationship between boys’ and girls’ attitude towards chemistry and their achievement in the subject?” The student sexes which were considered were the males and female students from both the single sex schools and the mixed sex schools. To investigate the attitude held by the students towards chemistry, various items were considered using the responses given. Table 4.20 provides information concerning the sex of the students and their feeling towards their performance.

Table 4.20: Sex of student versus feeling on performance in chemistry

			Feeling on performance in chemistry					Total
			disappointed	not happy	satisfactory	quite happy	very happy	
Sex of student	Male	Count	150	256	92	97	28	623
		% within Feeling on performance in chemistry	42.1%	50.5%	77.3%	63.4%	75.7%	53.2%
	Female	Count	206	251	27	56	9	549
		% within Feeling on performance in chemistry	57.9%	49.5%	22.7%	36.6%	24.3%	46.8%
Total		Count	356	507	119	153	37	1172
		% within Feeling on performance in chemistry	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

From table 4.20, a total of 406 boys are not happy with their performance, while 457 of the girls are not happy. This implies that a greater percentage of girls perform poorer than boys. On the performance of chemistry practicals, the information was presented on table 4.21 as follows.

Table 4.21: Student sex versus feeling about doing chemistry practical

			Feeling about doing chemistry practicals					Total
			always difficult	quite difficult	alright	fairly easy	very easy	
Sex of student	Male	Count	34	292	150	126	21	623
		% within Feeling about doing chemistry practicals	24.5%	48.7%	64.7%	78.3%	52.5%	53.2%
	Female	Count	105	308	82	35	19	549
		% within Feeling about doing chemistry practicals	75.5%	51.3%	35.3%	21.7%	47.5%	46.8%
Total		Count	139	600	232	161	40	1172
		% within Feeling about doing chemistry practicals	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

From table 4.21, a total of 326 boys find chemistry practical to be difficult while 413 girls find the practicals difficult. Still more girls than boys have a problem as far as chemistry practicals are concerned.

Table 4.2 compares the sexes in relation to their future chemistry careers.

Table 4.22: Sex of student versus chemistry related careers

			Would not choose chemistry/related careers					Total
			strongly agree	agree	do not know	disagree	strongly disagree	
Sex of student	Male	Count	56	75	79	179	234	623
		% within Would not choose chemistry/related careers	43.1%	57.3%	50.0%	47.5%	62.2%	53.2%
	Female	Count	74	56	79	198	142	549
		% within Would not choose chemistry/related careers	56.9%	42.7%	50.0%	52.5%	37.8%	46.8%
Total		Count	130	131	158	377	376	1172

From table 4.22, only 21% of the boys are not ready to take chemistry related careers while 23.7% of the girls are not ready. Therefore from this few examples, it is evident that more girls have a low opinion towards chemistry than boys. Consequently therefore, their attitude towards the subject is poorer compared to that of the boys.

4.4 Relationship between the category of school and attitude held towards chemistry

The fourth research question was “What is the relationship between the students’ attitude towards chemistry and the category of school?” The district has three category of secondary schools namely provincial, district and private schools.

The attitude scale total scores indicate that the students from provincial schools score higher followed by the district school and lastly the private schools. The same applies in their academic performance in chemistry as shown in table 4.23.

Table 4.23: Category of school, academic performance and the attitude held towards chemistry

School category	Mean KNEC exam score	Attitude item score
Provincial	3.8 (D)	72
District	2.9 (D-)	68
Private	2.2 (D-)	64

From table 4.23, the students from the three categories of schools have a neutral attitude towards chemistry. On their performance, provincial schools perform better than both the private and district schools.

4.5 Discussion

From the analysis of data, it is evident that majority of the students have a desire to do better in chemistry but every time they are subjected to a test or exam for the purpose of evaluation, their efforts are thwarted or frustrated and hence they hardly find themselves doing their very best in the subject. This poor performance demotivates them and hence leads to the development of unfavourable attitude towards the subject.

The responses of the learners to the 20 items were scored as follow. There were five levels of responses i.e. strongly agree or disagree, agree or disagree and not sure or

neutral response. Upon taking the response mean for every item, the items with a mean of 2.3 and below were taken to be negative, those items with a mean range of 2.4-3.6 were taken to be neutral and the item with a mean range of 3.7 – 5.0 was taken to be positive.

Therefore the responses of the learners to the 20 items were categorised as follows.

Low scores	Negative: Items	7,10,13
Average scores	Neutral: Items	1,2,3,4,6,8,9,11,12,19,20
High scores	Positive: Items	5, 15,16,17,18

The results also indicated that the students are definitely positive that they are idle in chemistry lessons, they hate chemistry, they can not understand chemistry no matter how much they try, chemistry is useful, they would not choose chemistry related careers, chemistry is boring and wish to do better in chemistry. This further is a confusion since the major aspects that determine performance in any area are not clear such as understanding of the concepts, motivation towards the subject, dedication of adequate time to the subject, aspirations in the future career etc are already affected. Implying that even if the students are aware that chemistry is useful, there is nothing they can do.

Chemistry is a practical based subject than theory. When the students were asked their feelings towards chemistry practicals, majority of the students were uncertain whether the practicals are difficult. Therefore the learners are confused about their feelings when doing the practicals. This is evident from the mean score awarded to this item which was 2.46 implying neutral.

The items concerning the study of chemistry more than other subjects and the understanding of the meaning of concepts and terms used in chemistry, the students scored 2.80 and 2.97. This implies therefore that if most of the students are not sure

whether they take much of their time in studying the subject and when they try it out they are not certain whether they understand the concepts and terms used, then little is expected from these students in terms of performance. This account for a higher mean score of 3.62 where the students are positively certain that they will not take chemistry related careers in life.

Data analysis also revealed that most of the students do not achieve high in chemistry simply because it is difficult to access teachers for consultation and clarification of some issues, studying during their private hours yield no positive fruits, and assignments as a form of revision is never possible among many other factors. Therefore even if the students are aware of how useful the subject is there is nothing much they can achieve and this consequently affects their attitude as they remain in a helpless and confused state.

From the data analyzed it was also evident that mixed school KNEC mean score was high compared to single sex schools. The reason may be attached to the competition that exists between the sexes in fear of one to be looked down upon as a failure. The low mean score for the single girls schools may be due to the fact that chemistry is viewed as a masculine subject and hence meant for men. When considering their overall item scores, all the three types of schools have neutral attitude and hence reason for the below average performance. Therefore the type of school where a student attends to has got a significant influence on the student's attitude towards chemistry and the academic performance.

Upon considering the students' academic achievement as reflected at the end of their course by the KNEC , the boys' mean score was 4.423 while that of the girls was 3.754. This indicates that boys perform better than girls and hence they are motivated to work harder .On the other hand, because of the poor attitude held by the girls towards the subject, their efforts are always fruitless and hence poor performance in the subject. Therefore the sex of the student influences the type of attitude held towards chemistry and this has a direct bearing on the final performance.

The analysis done also indicated a significant relationship between the students' attitude towards chemistry and school category i.e. private, district or provincial. Those from provincial schools performed better compared to those from district or private schools. The difference in performance may be attributed to the admission of students with high entry behaviour compared to those admitted to the other category of schools.

Therefore promotion of favourable attitude towards the subject is quite crucial at all secondary school levels to help the student to perform better.

4.6 Test of hypotheses

H₀1: There is no significant relationship between students' attitude towards chemistry and their performance in the subject.

This relationship was tested by the use of the Pearson Product Moment Correlation Coefficient, 'r'. In this study, a correlation between 0.1 – 0.49 was considered a positive weak relationship and that between 0.5 – 0.99 was considered a strong positive relationship. The hypothesis was tested at 0.05 or 95 % level of significance. In table

4.24, the relationship between total attitude scores and academic achievement in chemistry were compared.

Table 4.24: Pearson Correlation on student attitude and performance in chemistry

			Enjoy chemistry	Feeling on performance in chemistry
Spearman's rho	Enjoy chemistry	Correlation Coefficient	1.000	.519**
		Sig. (1-tailed)	.	.000
		N	1172	1172
	Feeling on performance in chemistry	Correlation Coefficient	.519**	1.000
		Sig. (1-tailed)	.000	.
		N	1172	1172

This gave $r = 0.519$ indicating a fairly strong relationship between the two variables. This means that those students who enjoy chemistry perform well in the subject. Therefore the null hypothesis which stated that there is no significant relationship between the students' attitude towards chemistry and their achievement in the area is rejected implying that there is a significant relationship between students' attitude towards chemistry and their performance in the subject.

H₀₂: There is no significant difference between the boys' and girls' attitude towards chemistry and their performance in the subject.

This null hypothesis was tested using data that was analysed statistically by use of cross tabs where the school types were being compared and then analysed by the chi-square.

Table 4.25 represents the analysis.

Table 4.25: The chi-square statistics on gender attitude and type of school

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	27.782 ^a	8	.001
Likelihood Ratio	31.793	8	.0001
N of Valid Cases	1172		

a. 2 cells (13.3%) have expected count less than 5. The minimum expected count is 3.13.

The chi-square was performed at 0.05 level of significance and 8 degrees of freedom. The $X^2 = 27.78$, and $P = 0.001 < P_{\text{crit}} = 0.05$. This again implies that the results are significant and therefore the null hypothesis is rejected meaning that there is a significant difference in attitude in students from single and mixed schools.

The same results were obtained when a t-test was performed on the attitude held by students towards chemistry and their academic achievement from various schools as shown in table 2.26. It is evident again that the type of school has a slight influence on the attitude held towards chemistry and the performance in the subject.

Table 4.26: Type of school, sex, attitude and academic performance

	Boys' schools	Girls' schools	Mixed schools
Students' attitude t-test values	72	64	70
Academic performance	4.23	3.754	5.245

Though both students from either type of school fail, the leading lot is that of the female students and this may be attributed to peer discouragement and lack of adequate health

competition amongst them. Generally when comparing the students who are satisfied with their performance to those dissatisfied, it is evident that more female students are failures in the subject. This means that the majority of the female students are the ones who have unfavourable liking towards the subject. This implies that their attitude is negatively affected and hence a negative opinion as far as chemistry and its related careers are concerned.

H₀₃: There is no significant difference between boys' and girls' attitude towards chemistry from single and mixed secondary schools.

In testing this null hypothesis, a chi-square test was performed as in table 4.27.

Table 4.27: Chi-square test for hypothesis 3

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	60.676 ^a	4	.001
Likelihood Ratio	63.102	4	.001
N of Valid Cases	1172		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 17.33.

From table 4.27, the chi-square was performed at 0.05 level of significance and 4 degrees of freedom. The $X^2 = 60.67$, and $P = 0.001 < P_{crit} = 0.05$. Therefore the results are significant implying that there is a significant difference between the boys' and girls' attitude towards chemistry and their performance in the subject.

H₀₄: The category of school has got no significant influence on students' attitude towards chemistry.

The null hypothesis was also tested by use of a chi-square statistics. The analysed data was presented on table 4.28.

Table 4.28: The chi-square statistics for hypothesis 4

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	24.513 ^a	8	.002
Likelihood Ratio	26.713	8	.001
N of Valid Cases	1172		

a. 5 cells (33.3%) have expected count less than 5. The minimum expected count is 1.26.

The chi-square was performed at 0.05 level of significance and 8 degrees of freedom. The $X^2 = 24.51$, and $P = 0.002 < P_{crit} = 0.05$. Again these results were significant implying that the null hypothesis was rejected. Therefore the category of school where one is admitted in will determine the type of attitude one will develop and this consequently will affect performance.

4.7 Conclusion

From data analysis, it is evident that students hold a neutral attitude towards chemistry and this affects their achievement in the area. There is a difference between attitude towards chemistry between students from single and mixed secondary schools. The studies also indicated that there is gender difference in the attitude held towards chemistry. It was again evident that the category of school influence the attitude held towards the subject. Thus, the attitude held by the students towards chemistry will determine their performance in the subject. Therefore attitude is an important aspect that needs to be well developed so that it may not hinder a learner's performance negatively.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.0 Introduction

This study was concerned with the relationship that exists between the attitude held by form four students towards chemistry and their achievement in the subject. This chapter therefore presents a summary of the entire study, conclusion that was drawn on the basis of research hypotheses, recommendations and suggestion for further research.

5.1 Summary of the study

The purpose of the study was to establish the relationship between attitude and achievement in chemistry. The subjects for the study were form four students from both single and mixed secondary schools in Central Kisii District.

The study was guided by research objectives and hypotheses .The study was limited to a sample of 1172 students which was 19.05% of the total population. The relevant literature reviewed indicated that little has been done in Kenya to establish the relationship between attitude and achievement in chemistry. The study employed an ex post facto research design and the subjects for the study were selected through random sampling. Data was collected by use of questionnaires and analysed by both descriptive and inferential statistics using the SPSS program to test the hypotheses. The results obtained indicated that there is a relationship between attitude held towards chemistry

and achievement in the subject ($r = 0.519$). The study also indicated that there is a significant difference between attitude towards chemistry between students from single and mixed secondary schools. There was gender difference in the attitude held towards chemistry. This also gave a χ^2 value with P value of 0.001 at $\alpha = 0.05$ level of significance. It was indicated that the category of school influences the type of attitude one develops and this has a direct bearing on the performance of the student.

5.4: Conclusion

Chemistry is one of the paramount subjects that have to be handled carefully by teachers since it cuts across all science disciplines. The attitude held towards this subject will determine whether they will perform exceptionally good or vice versa. Once this attitude has been developed, it may be difficult to change it. Thus performance in this area should be enhanced so that the students may stand a better chance to pursue future chemistry related careers.

However from this study, it is evident that the attitude held towards chemistry by the students was neutral and this has a direct bearing on their poor performance in the subject. This gives an indication why the performance has remained poor for a long period of time within the entire Central Kisii District. The studies indicated that despite the utility of the subject, learners are in a state of 'confusion' that they do not know what to do in order to perform better so as to be in a position to pursue chemistry related careers in future.

Gender difference in attitude and academic performance amongst the students is also an issue that needs to be addressed as soon as possible so that attitude may not affect

performance at any level of learning. Therefore cultivation of a favourable attitude amongst all students towards chemistry is crucial for them to realise better performance in the subject.

5.5: Recommendations

On the basis of these findings, it is important that the teachers and other relevant stakeholders help the students or learners to develop a positive attitude towards chemistry as it is an important area that cuts across all science related careers.

Health competition amongst all learners should be encouraged to enhance performance regardless of gender, type of school or category of school to be able to compete in the world market.

5.5 Suggestion for further research

From the findings, it is evident that the learners have a neutral attitude towards chemistry. Investigations should be launched to establish the possible causes of the confusion that exists amongst the learners and their state of uncertainty which makes them to perform poor.

There is also gender disparity on the attitude held towards chemistry. Research should be conducted to investigate why the difference and yet all the learners are taught the same content, using the same syllabus, within the same time span.

Further investigation should be done focusing the relationship between teacher's attitude towards teaching chemistry and the academic achievement of their learners.

The present study focused only Central Kisii District. Efforts should be made to find out the extent to which attitude influence academic achievement in chemistry countrywide.

BIBLIOGRAPHY

- Aghenta J.A (1989). *Access by Women to Scientific Studies and Technological Training*
In: Report of the National Workshop on Promoting Science, Technology, and
Mathematics among Girls and Women in Nigeria.Pp37-39. Ikuji-Lagos, Nigeria:
Federal Ministry of Education (Women Education Branch).
- Akinmade, C.T.O (1982). An Investigation of Attitude and Perceptions of Junior High
School Students Towards Science Courses. *Dissertation Abstract International*
Vol. 43, No.2, p.413.
- Aremu, A (1998). Motivating learners for More Achievement in Mathematics. *Journal of
applied Psychology*, 4 (1), 27-34.
- Banu, D. P (1985). Attitude Towards Science Held by Secondary School Students in
Gongola State, Nigeria. *Dissertation Abstract International* Vol. 45, No. 7,
p.2055 .
- Bell,F.H (1980). *Teaching Elementary School Mathematics: Methods and Contents for
Grade 1 – 8*. Dubuque, Iowa WMC: Brown Company publisher.
- Burrow, E.D (1978). The Relationship Among Secondary Science Students Locus of
Control, Views of the tentativeness of Science, Attitudes, Perceptions of Teaching
Strategies and Achievement. *Dissertation Abstract International* Vol. 39, No. 7,
p.2165.
- Cohen, L. and Manion, L (1994). *Research Methods in Education* (4th ed.). Rutledge:
London.
- Commonwealth Secretariat (1976). “Low-Cost Science Teaching Equipment”.
Common wealth Regional Seminar Workshop. Nassau: Bahamas.
- Connel, J.P, and Wellborn, J. G (1991). Competence, Autonomy and Relatedness: A
motivational Analysis of Self-System Processes. Pg 43-77 in Megan R. Gunnar
and L. Alan Sroufe (eds), *Minesota Symposium on Child Psychology*, vol 23.
Hillsdale, N.J: Law-rance Erlbaum.
- Davidson,A.L(1999). Negotiating Social Differences: Youths’ Assessments of Educators
Strategies, *Urban Education*, 34: 338-369.

- Endsley, G.J (1984). The Relationship to Cognitive Preference, Sex and Attitude on Achievement scores in a first Year Algebra Course. *Dissertation Abstract International* Vol. 45, No. 7, p. 107.
- Eshiwani G.S(1974). Mathematics and Science Education in Kenya: Issues and Problems. *Kenya Education Review* Vol. No. 2. p 5 –18.
- Eshiwani G.S. (1983). *Factors Affecting Performance Among Primary and Secondary School pupils in western province Kenya: A Policy Study*. B.E.R. Kenyatta University: Nairobi, Kenya.
- Eshiwani, G.S (1986). *Science, Mathematics and Technology Education in Kenya*. Bureau of Educational Research: Seminar on Priorities in Educational Research Seminar Proceedings. B.E.R. Kenyatta University: Nairobi, Kenya.
- Evans, K.M (1972). *Attitudes and Interest in Education*. Routedledge: London.
- Gambone M.A, Adena M.K, Jean A.S, Theresa A.A and Cynthia L(2004). *Turning the Tide: The Achievements of the First Things First Education Reform in the Kinsas City, Kansas, Public School District*. Philadelphia; Youth Development Strategies, Inc.
- Gross,R (1996). *Psychology the Science of Mind and Behaviour* (3rd ed).Hordder Headline: London, U.K.
- Hardesty,C(1992). “*Partial Involvement and the Development of Gender Expectations in Sons and Daughters*”. Paper Presented at the Annual Conference of the National Council on Family Relations.(ERIC Document Reproduction Services No.ED 359495).
- Hilgard, N.R.and Bower,G.H(1974). *Theories of Learning*. Prentice Hall Inc: New Jersey.
- International Labour Office (1972). *Publication on Jobs and Employment in Kenya*.Westlands, Nairobi.
- Jihoda, M. and Warren, S (1966). *Attitude* (2nd ed.). Harmondsworth, Middlesex: Penguin.
- Kegan, J (1972).*Attitude Development and Behaviour Changes* (2nd ed.). Harvard University :Cambridge, Massachusetts.

- Kelly, A (1981). *The Missing Half*: Manchester University Press.
- Kenya National Examination Council. (2001). "The Year 2000 Kenya Certificate of Secondary Examination Candidates Performance Report, Nairobi.
- Kindred, L. W (1976). *The School and Community Relations*. Prentice Hall Inc: New Jersey.
- Krajkovich, J.G (1978). The Development of Science Attitude Instrument and an Examination of the Relationship Among Science Attitude, Field Dependence-Independency and Science Achievement. *Dissertation Abstract International* Vol.43, No.1, p.131.
- Kull,J.A.R (1982). The impact of the Aptitudes,Science Program, and Classroom Climate on Students' Attitude Towards Science. *Dissertation Abstract International* Vol.43, No.1,p.131.
- Kyalo,F.M (1984). A study of the Factors that Affect Science Teaching and Learning in Some Primary Schools in Changwithya Location Kitui District. Unpublished, M.ED Thesis, Kenyatta University.
- Lee, V.E.and Lockheed, M.A (1990). The Effect of Single Sex Schooling on Achievement and Attitudes in Nigeria. *Comparative Education Review*. 34 (2): 209-231.
- Lovell, K. and Lawson, K.S (1970). *Understanding Research in Education*. Neill and Co. Ltd: Edinburgh.
- Magiri, J.B (1986). 'A Study of the Relationship Between Attitude and Achievement in Top Quartile and Lower Quartile in Physics Among Form Four Students in Imenti Division of Meru District. Unpublished M.Ed. Thesis, Kenyatta University: Kenya.
- Maundu, J.N (1986). "Student Achievement in Science and Mathematics. A case study of Extra Provincial and Harambee Secondary Schools in Kenya". Unpublished Ph.D. Dissertation, Department of Secondary Education Mc Grill University: Montreal
- Mordi,C (1991). Factors Associated with Pupils' Attitude Towards Science in Nigeria Primary Schools. *Research in Science and Technological Education*. 9(1): 39-49.

- Moffat C (1992). "Girls and Science Careers: Positive Attitudes are not Enough". Paper Presented at the Meeting of National association for Research in Science Teaching. (ERIC Document Reproduction Service No. ED362 400).
- Nanwa, O. C (1982). *Introduction to Educational Research*. Heinemann Education books ltd: Ibadan.
- National Research Council (2003). *Engaging Schools; Fostering High school Students' Motivation to Learn*. Committee on Increasing High school Students Engagement and Motivation to Learn . National Research Council. Washington DC: National Academy Press.
- Ndonga, W (1999). "The relationship Between Attitude and Academic Achievement in Science Amongst Form Four Students in Ukwala Division, Siaya District. Unpublished M.Ed. Thesis. Kenyatta University.
- Njuguna, S (1998). "The relationship Between Attitude and Academic Achievement in Science Among Form four Students in Kigumo Division. Unpublished M.Ed. Thesis. Moi University.
- Orodho, A.J (1996). "Factors Determining Achievement in Science Subject at Secondary School Level in Kenya". Unpublished Ph.D. Thesis (BER). Kenyatta University.
- Orodho, A.J (2005). *Elements of Education and social Science Research Methods*. Masola Publishers, Nairobi.
- Petty, R. E. and Ccippo.J.T (1981). *Attitudes and Persuasion: Classic and Contemporary Approaches*. Dubuque, Iowa, Brown.
- Ranjit, K (1999). *Research Methodology*. Sage Publications, London; New Deli.
- Republic of Kenya (1964). *Kenya Education Commission (Ominde Report)*. Government Printer: Nairobi.

Republic of Kenya (1976) *The 8-4-4 System of Education*, Ministry of Education Science and Technology. Government Printer: Nairobi.

Republic of Kenya (1985). *The 8-4-4 System of Education*, Ministry of Education Science and Technology. Government printer: Nairobi.

Republic of Kenya (1998). *Report of the Commission of Inquiry into the Education System of Kenya* (Koech Report). Government Printer: Nairobi.

Rokeach, M (1968). *Beliefs, Attitude and Values*. Jossey – Bass, San Francisco: America.

Slatter, C. L (1977). A Five – year Study of Flexibility, Fluency, and Originality with Attitudes Towards Science. *Dissertation Abstract International* Vol.37, No. 8, p. 5017.

Stoner C.L (1981).The relationship of Psychology and Skill Factor to Science Attitudes and Achievement of the Fifth and Tenth Grade Students. *Dissertation Abstract International* vol. 44, No, 8, p.2431.

Talton, E.L (1984). *Relationship of Attitudes Towards Classroom Environment with Attitudes Towards Science and Achievement in Science Among Tenth Grade Biology Students*. Dissertation Abstract International Vol.44, No.8, p. 2431.

Tamir,P (1974). “An Inquiry Oriented Laboratory Examination” *Journal of Educational Measurement II*. Vol. 7, No.8, p. 231.

Thorndike, E (1932). *The Fundamentals of Learning*. New York. Teachers College Press.

Twoli, N.W (1986). “Sex Differences in Science achievement Among Secondary students in Kenya”. Unpublished Ph.D. Thesis Flinders. University of South Australia.

Wellington, J (1989). *Skills and Process in Science education a Critical Analysis* Routledge: London, U.K.

Zimbardo, P.G. and Leippe, M (1991). *The Psychology of Attitude Change and social Influence*. Mc Graw Hill: New York.

APPENDICES

APPENDIX A: STUDENT QUESTIONNAIRE

STUDENTS' ATTITUDE TOWARDS CHEMISTRY QUESTIONNAIRE (SATCQ)

This questionnaire seeks to obtain information that will be of help in finding out the influence of attitude on academic achievement. You are requested to respond to the items as honest as possible. The information you provide will only be used for the purpose of research and will be kept confidential. Therefore do not write your name on this paper. Please note that there are no correct or wrong responses to these items but what is only appropriate to you. Indicate what is appropriate to you by using a tick (✓)

Indicate your:

- i) Sex (male/female).....
 ii) Type of school (single sex / mixed sex).....

1 Do you enjoy chemistry?

- A. My most liked subject.
- B. I quite like it.
- C. It is alright.
- D. I do not like very much.
- E. My least liked subject.

2. The work in chemistry is:

- A. Too easy.
- B. Fairly easy.
- C. About the right level.
- D. Quite difficult.
- E. Most difficult.

3. When you work by yourself is it easy to understand what to do in chemistry?

- A. Very easy.
- B. Quite easy.
- C. Alright.
- D. Sometimes difficult.
- E. Always difficult.

4. How easy is it to get help from the teacher if you are stuck in your chemistry assignment?

- A. Very easily.
- B. Quite easily.

- C. Alright.
 - D. Sometimes difficult.
 - E. Always difficult.
5. Is there ever a time in chemistry lesson when you had nothing to do?
- A. Always.
 - B. Frequently.
 - C. Some times.
 - D. Do not know
 - E. Never.
6. How well do you understand the meaning of concepts and terms used in chemistry?
- A. Very well.
 - B. Quite well.
 - C. Fairly well.
 - D. Not very well.
 - E. Not at all.
7. How happy are you with your results in chemistry?
- A. Very happy.
 - B. Quite happy.
 - C. Satisfactory happy.
 - D. Not very happy.
 - E. Very disappointed
8. I like studying chemistry than any other subject:
- A. Strongly agree.
 - B. Agree.
 - C. Do not know.
 - D. Disagree.
 - E. Strongly disagree.
9. The subject I hate is chemistry.
- A. Strongly agree.
 - B. Agree.
 - C. Do not know.
 - D. Disagree.
 - E. Strongly disagree.
10. How do you feel about doing practicals in chemistry?
- A. Very easy.
 - B. Quite easy.
 - C. Alright.
 - D. Sometimes difficult.

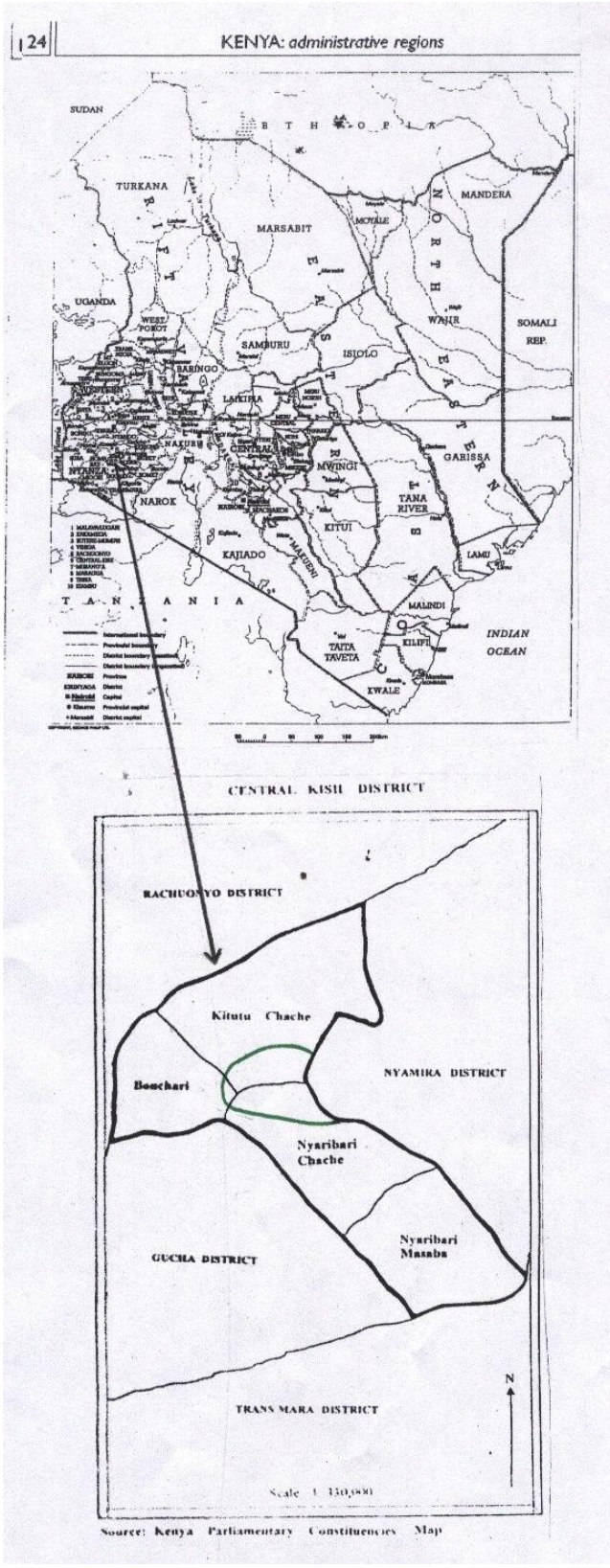
- E. Always difficult.
11. Chemistry is a subject which is more difficult to understand
- A. Strongly agree.
 - B. Agree.
 - C. Do not know.
 - D. Disagree.
 - E. Strongly disagree.
12. No matter how hard I try, I can not understand chemistry:
- A. Strongly agree.
 - B. Agree.
 - C. Do not know.
 - D. Disagree.
 - E. Strongly disagree.
13. I try to do the very best I can in chemistry:
- A. Strongly agree.
 - B. Agree.
 - C. Do not know.
 - D. Disagree.
 - E. Strongly disagree.
14. I can get along perfectly well in everyday life without chemistry:
- A. Strongly disagree.
 - B. Agree.
 - C. Do not know.
 - D. Disagree.
 - E. Strongly disagree.
15. Chemistry is useful in life:
- A. Strongly agree.
 - B. Agree.
 - C. Do not know.
 - D. Disagree.
 - E. Strongly disagree.
16. I would not like to do chemistry or any other chemistry related career after my form four.
- A. Strongly agree.
 - B. Agree.
 - C. Do not know.
 - D. Disagree.
 - E. Strongly disagree.

17. Chemistry lessons are boring and should be reduced to be less than what they are on the time table.
- A. Strongly agree.
 - B. Agree.
 - C. Do not know.
 - D. Disagree.
 - E. Strongly disagree.
18. I wish I could do better in chemistry
- A. Strongly agree.
 - B. Agree.
 - C. Do not agree.
 - D. Disagree.
 - E. Strongly disagree.
19. How do you find chemistry assignment or homework?
- A. Very easy.
 - B. Quite easy.
 - C. Alright.
 - D. Sometimes difficult.
 - E. Always difficult.
20. I have not always liked doing chemistry tests, assignments and homework:
- A. Strongly agree.
 - B. Agree.
 - C. Do not know.
 - D. Disagree.
 - E. Strongly disagree.

APPENDIX B: LIST OF CENTRAL KISII DISTRICT SECONDARY SCHOOLS


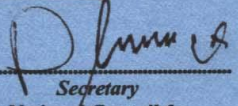
BOY SCHOOLS	GIRL SCHOOLS	MIXED SCHOOLS	
Kisii School	Nyabururu Sec.	Itiero Sec.	Kisii Highlights
Cardinal H.Sch.	Kioge Sec.	Suneka Sec.	Nyanchwa Mixed
Itibo Secondary	Kereri Sec.	Kenyoro Sec.	M tailor
Nyakeiri Secondary	Itibo Sec.	Gesero Sec.	St stephene
Moi Gesusu		Gianchere Sec.	Green valley
		Kegati Sec.	Roberts Harven
		Nyamokenye Sec.	Nyota
		Nyanchwa Sec.	Bishop mogendi
		Amabuko Sec.	Keoke Fam
		Nyambunwa sec	Nyankanda
		Kiomiti sec	Nyosia
		Nyaguta sec	Tambacha
		Marani sec	Nyanko
		Kiaren sec	Mlimani Ramasha
		Ititi sec	Nyakoora
		Masakwe sec	Kiogo
		Nyagesenda	Upridge
		Rioma	Nyakome Fam
		Eramba	Geturi
		Kirwa	Nyaboterere
		St. Peters Kerera	Nyatieko
		Ong'icha	Matieko
		Amasago	Nyabworoba
		Nyansira	Nyamware
		Olv Nyambara	Raganga
		Nyamawa SDA	Kiamabundu
		Nyaura DEB	Masongo
		River Bank ACA	Metembe
		Nyakeyo COG	Amariba
		Irungu	Boruma
		Ibeno	Hill Secondary

APPENDIX C: KISII CENTRAL DISTRICT MAP



APPENDIX D: RESEARCH

PERMIT

<p>PAGE 2</p> <p>THIS IS TO CERTIFY THAT:</p> <p>Prof./Dr./Mr./Mrs./Miss. SABELLAH NYABONYI MOCHIRE</p> <p>of (Address) MOI UNIVERSITY PO BOX 3900 ELDORET</p> <p>has been permitted to conduct research in</p> <p>.....Location, KISII CENTRAL</p> <p>.....District, NYANZA</p> <p>.....Province,</p> <p>on the topic THE RELATIONSHIP BETWEEN ATTITUDE AND ACADEMIC PERFORMANCE IN CHEMISTRY AMONG SECONDARY SCHOOL STUDENTS: A CASE OF CENTRAL KISII DISTRICT, KENYA</p> <p>for a period ending 31ST DECEMBER 20⁰⁹</p>	<p>PAGE 3</p> <p>Research Permit No. NCST/5/002/R/859</p> <p>Date of issue 14.09.2009</p> <p>Fee received SHS 1000</p> <div style="text-align: center;">  </div> <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <div style="text-align: center;"> <p>.....</p> <p><i>Applicant's Signature</i></p> </div> <div style="text-align: center;">  <p>.....</p> <p><i>Secretary National Council for Science and Technology</i></p> </div> </div>
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REPUBLIC OF KENYA



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Our Ref: **NCST/5/002/R/859/6**

Date: **14th September, 2009**

**Sabellah Nyabonyi Mochire,
 Moi University,
 P. O. Box 3900,
ELDORET**

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on "*The relationship between attitude and academic performance in Chemistry among secondary school students: A case of Central Kisii District, Kenya*" I am pleased to inform you that you have been authorized to undertake your research in *Kisii Central District* for a period ending **31st December 2009**.

You are advised to report to *the District Commissioner and the District Education Officer Kisii Central District* before embarking on your research project.

Upon completion of your research project, you are expected to submit two copies of your research report/thesis to our office.

**PROF. S. A. ABDULRAZAK Ph.D, MBS
 SECRETARY**

Copy to:
 The District Commissioner
 Kisii Central District