FACTORS INFLUENCING PERFORMANCE IN KCSE SCIENCE SUBJECTS: A CASE OF SELECTED SECONDARY SCHOOLS IN ELDORET MUNICIPALITY

BY

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DECLARATION

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DEDICATION

This work is dedicated to
my mother Susan Emali,
whom I wish was alive
to share with me the joy
of this achievement.

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I wish to thank the following people whose contribution to this work is priceless: Professor D .K.Serem and Mr Z. K..Kosgey of Moi University who were my supervisors. They guided me all the way to the end. Dr Too and Dr. J. K. Boit of Moi University who taught me the theory part of research methods. All the other lecturers of Moi University who took me through the course work. My husband Eng.Mudulia who provided both financial and moral support. My children, Lovega ,Imali, Mudulia and Khambiha who tolerated my divided attention when l sometimes got too busy to spend quality time with them. My step son lnjori who helped with the type-setting. The Uasin Gishu District and Eldoret Municipal Education officers who granted me permission to conduct research and availed the necessary documents to me.

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LIST OF ABBREVIATIONS

BOG	Board of Governors.
KCPE	Kenya Certificate of Primary Education
KCSE	Kenya Certificate of Secondary Education
KESSP	Kenya Education Sector Support Programme
TSC	Teachers' Service Commission

LIST OF ACRONYMS

CEMASTEA - Center for Mathematics, Science and Technology.

FEMSA- Female Education in Mathematics and Science in Africa.

JICA- Japanese International Co-operation.

SMASSE- Strengthening Mathematics and Science in Secondary Education.

SMASSE WECSA - Strengthening Mathematics and Science in Secondary Education in Western, Eastern, Central and Southern Africa.

TIMSS- Third International Mathematics and Science Study

ABSTRACT

Students' performance in sciences has been a perennial global problem. Within Eldoret Municipality, the perpetual poor performance in KCSE science subjects has been a cause for a lot of concern to the stakeholders of secondary school education. This study sought to investigate the factors that influence performance in KCSE- science subjects. The investigation was based on a theoretical foundation based on the systems theory which was formulated by Bertalanffy (1968) and proposed by Katz and Kahn (1966) as one suitable to be applied to organisations. Stratified random sampling was used to draw a sample of 14 head teachers, 49 teachers and 289 form three students. Stratification was based on the schools' performance in KCSE science subjects for the period 2001-2005 to obtain 7 schools in the low performing schools and 7 schools from the high performing schools. The data was collected with the aid of three questionnaires administered to the head teachers, teachers and students. Descriptive statistics were used to analyse and summarise the data. T-test was used to test for significant differences between means of low performing and high performing schools. Correlation was used to show relationships between performance and the research variables. The findings of this study are not revolutionary but point to the need for coordinated efforts to solve the problem of poor performance in sciences as it is multi-faceted. The key factors identified as predictors of performance in KCSE science were school factors of availability of laboratories, teacher factors of the involvement of learners in investigation of ideas, home factors of social-economic status, student factors of their input in reading science textbooks and their perception of the usefulness of sciences in everyday life.

The study has practical implications for learners, teachers, school administrators, parents and educational officials. The ministry of education should initiate training programs or enhance ongoing ones for head teachers and science teachers based on the findings. Key factors identified as causes of the difference in performance between low and high performing schools were: entry behaviour, resources, motivation, and whether the school was day or boarding or, mixed or single sex. Thus, all education providers should strive to adequately equip schools, motivate teachers and build more boarding schools

CHAPTER ONE

1.0 INTRODUCTION TO THE STUDY

This chapter consists of eleven sections. The first section is the background to the study, which gives the general situation on performance in science in America, Europe, Asia, Africa as a whole and finally Kenya, where Eldoret municipality is situated. The other sections are:

- Statement of the problem
- Objectives of the study
- Research questions
- Justification of the study
- Significance of the study
- Scope of the study
- Limitations of the study
- Assumptions of the study
- Conceptual framework
- Definition of terms

1.1 BACKGROUND TO THE STUDY

The performance in science subjects in secondary schools in Eldoret Municipality is generally below average. Eshiwani (1986), while commenting on the situation in the country said that achievement in what is offered as science is astonishingly poor. He cited lack of facilities, trained teachers or even psychological factors as the causes. Poor performance in Science is almost a tradition in Africa (The Standard 6th September 2007).The article, about a meeting of African ministers of education in Johannesburg stated that: “The delegates noted that while low achievement in science is historical,

students' limited interest is rooted in how the subjects are taught". This is echoed in The Kenya Education Sector Support Programme (KESSP) (2005-2010). One may think that the problem is limited to African countries. However, in an article in The Standard newspaper of 20th January 2005 titled "US students in bid to better their Asian counter parts, Muya reports that American children do not do as well in mathematics and science as their counterparts in the Asian Tigers - Singapore, Korea, Japan and Hong Kong. This is in spite of the fact that American students have access to all the textbooks required and the Internet free of charge as education is paid for by the state and municipal taxes.

Valverde & Schmidt (1997) confirmed the same finding based on work done in the United States on Maths and Science. They posit that international comparisons of schooling hold important lessons for improving student achievement. Their study known as the 'Third International Mathematics and Science Study (TIMSS) involved half a million students' scores across 5 continents and 41 countries. Part of the findings was that U.S. students performed well in fourth grade, but by the eighth grade, they fell substantially below their international peers. They performed below the international average in math and just above average in science. Hence, a comment from the writer says "we are not likely to be the first in the world by the end of this century in either science or mathematics".

Landry (1998) describes the poor performance of the Canadian education system and states that "when it comes to science and mathematics, we are sadly behind in international ranks as 14% of the population in Nova Scotia have low numeric (Landry 1998: 1).

Further evidence that this is a world-wide problem is suggested by Fonseca and Conboy (2006). Their study on secondary students' perceptions of factors causing failure in science in Portugal explored the major factors of failure in 10^{th} grade science–tracked students in Portugal. Their objective was to find out why students who are selected to study science at 10^{th} grade because they are the best in the subjects still fail .These researchers reveal that other studies done in 2000 and 2003 involving 40 countries found that Portugese students rank among the lowest in science performance in spite of successive reforms in science education.

In Africa, the problem of poor performance in science is so rampant that it has led to the establishment of in-servicing of teachers (INSET) known as Strengthening of Teaching Mathematics and Science in Secondary Education (SMASSE) in Kenya with the help of the Japanese International Co-operation (JICA). This grew to become SMASSE-WECSA that is, strengthening of mathematics and science in secondary schools education in Western, Eastern, Central and Southern Africa whose membership has grown from 11 countries in 2001 to 23 currently. This has led to the establishment of the Centre for Mathematics, Science and Technology in Africa (CEMASTEA) (KSSP 2005-2010).

The problem is further complicated by gender imbalance as female students score much lower grades than male students on average. Due to this, a project known as Female education in Mathematics and Science in Africa (FEMSA) was started in 1996. The aim of the project is to promote participation of girls and enhance performance so as to increase their access to careers in these subjects. The pilot phase was done in Cameroon, Ghana, Tanzania and Uganda. Maraffi (2002), in an internet article states that teacher styles such as cooperative rather than competitive learning plays a pivotal role in girls' performance.

In Kenya, poor performance in science subjects is observed from year to year in the KCSE results. The proliferation of bridging courses in mathematics and science subjects in the universities is proof of poor performance. For instance, an article on the internet by Moi University (2006) advising students in need of bridging courses states as follows: *"A large number of candidates would like to pursue Tertiary and University education on completion of high school but are restricted by poor performance in mathematics and science subjects. To address this phenomenon, the school of science offers bridging courses in these subjects".* These are offered to students who score a 'C' in a cluster subject required for entry into science- based courses. As can be seen from appendix ii, majority of students in Elderet Municipality do not even attain this C grade.

Several commissions have been set up to look into general problems facing education as a whole. The Gachathi report (1976) recommended that the teaching of mathematics, science and prevocational subjects should be greatly improved. Thirty years down the line, not so much has improved as we are still talking about the same thing. The poor results in science also reveal this.

The rapid changes in technology, communication, medicine and many other fields require good knowledge of science subjects. For instance, mathematics, chemistry and biology are key subjects in the profession of food technology as food technologists study chemical engineering, physics, biochemistry, genetics, and microbiology (Standard newspaper, 6th October 2005). Tsuma (1998) states that science provides the key to economic development through production of technology. In a presentation at the international conference on financing of higher education in Eastern and Southern Africa, Chacha Nyaigoti Chacha cited the dichotomy and imbalance

between science and technology students on one hand and arts and social science students on the other hand(Burton L.M et al).

Other commissions set up to solve education woes include the Ominde report (1964), Ndegwa report (1971, Mackay report (1981), Kamunge report (1988) and the recent Koech report (1998). Some recommendations of these reports suggested that science educationists should develop appropriate instructional methods and simple apparatus to teach these subjects. An article in the standard newspaper of 28th April 2005 says "mathematics and science are Africa's hope". Eshiwani (1974) states that schools have the task of providing the understanding that science and mathematics education is basic to modern agriculture, industry and technology. In spite of this plain truth and the efforts that the Kenya government is making to improve performance, not so much has been achieved. Some of the problems sited include lack of equipment, inadequate textbooks and shortage of teachers.(Kenya Education Sector Support Programme (KESSP) 2005-2010). However, what is emerging is that even schools with adequate resources like Nakuru High also register low grades (The Standard 23rd March and 6th October 2005).

As such, what the teacher does with the available resources is critical. Woessman (2001) explored reasons why students in some countries do better and observed that, without the right incentives, teachers may avoid using the most promising teaching strategies, preferring to use the techniques they find most convenient. This is why SMASSE was introduced to improve teachers' capacity (KESSP). Its aim is to re-train teachers to help them change learner's attitudes and their own towards the subjects and improvising of teaching and learning resources. SMASSE is concerned with the teachers' role. On the other hand, it should be noted that there are several other factors

that play a very important role in determining performance in science subjects. Thus a more holistic approach needs to be employed in solving this problem. Uasin Gishu District, in which Eldoret Municipality is found, registers low performance in science subjects. The table below shows the district mean grades in these subjects from the year 2001 to 2006.

Table 1.1 Uasin Gishu District KCSE Mean Grades in Biology, Chemistry And Physics For The Years 2001 To 2005

Year/Subject	Biology	Chemistry	Physics
2001	5.397	3.702	4.656
2002	4.910	3.795	5.618
2003	4.972	4.089	5.091
2004	5.884	4.171	5..350
2005	4.477	3.739	4.757

SOURCE: Uasin Gishu District 2004 and 2005 Results (Editions for Education Day)

From the table it can be seen that the district mean for each of the three subjects has ranged between 3 and 5 since 2001.This translates to a mean grade range of D to C-, which is rather low. This means that majority of the candidates not only fail to qualify for degree and diploma courses in science –based careers but also do not qualify for the bridging courses that would make them eligible**.**

1.2 STATEMENT OF THE PROBLEM

The problem of poor performance in science subjects is global as indicated by studies done by Valverd and Schmidt (1997) in USA, Landry (1998) in Canada, Fonseca and Conboy (2006). This problem is made worse in developing countries by the existing digital divide, poverty and other problems unique to the third world. A study by Kizito (1986) in Kenya attributes poor performance in KCSE science subjects mainly to poor teaching of the subject at primary level. This concurs with the findings of a study by Atieno(2000) on factors affecting performance in KCPE science paper in Bondo Division. Kizito gives other causes of poor performance as poorly trained teachers, negative attitude and a big workload. In Eldoret Municipality, performance in KCSE science subjects is very poor as majority of the students score C-. This is a poor grade as it bars learners from entry into science- based degree and diploma courses. This problem has persisted for a long time leading to very low district mean grades in these subjects.

The problem of poor performance in KCSE science subjects in secondary schools in Eldoret Municipality was therefore the core of this study.

1.3 MAIN OBJECTIVE OF THE STUDY

In view of the problem stated, the study intends to find out the factors that influence poor performance in science subjects in secondary schools in Eldoret municipality.

The researcher looked at what the schools have and how they use what they have to produce the results they produce.

1.3.1 Specific objectives

The specific objectives of this study were:

1) To establish the influence of human and non-human resources for teaching science subjects on performance in sciences within Eldoret Municipality.
2) To find out the influence of specific administrative factors of: head teachers' qualifications, experience, leadership styles, and degree of supervision, delegation, teamwork and involvement of teachers in decision-making on performance in sciences within Eldoret Municipality.
3) To find out the influence of teacher factors of: attitude, motivation, experience, competence, and the methods of teaching on performance in sciences within Eldoret Municipality.
4) To find out the influence of students factors of: attitude towards science, indiscipline, and entry behaviour on performance in sciences within Eldoret Municipality.
5) To explore the influence of school characteristics of: public/private, boys/girls/ mixed and day/boarding on performance in sciences within Eldoret Municipality.

1.4 RESEARCH QUESTIONS

1. What is the influence of human and non-human resources for teaching science subjects on performance in sciences within Eldoret Municipality?
2. What is the effect of specific administrative factors of: head teachers' qualifications, experience, leadership styles, degree of supervision, delegation,

teamwork and involvement of teachers in decision-making on performance in sciences within Eldoret Municipality?

3. To what extent do teacher factors of: attitude, motivation, experience, competence, and the methods of teaching influence performance in sciences within Eldoret Municipality?
4. What is the relationship between students' factors of: attitude towards science, indiscipline, and entry behaviour on performance in sciences within Eldoret Municipality?
5. How do school characteristics of: public/private, boys/girls/mixed, day/boarding and social economic status of the school community affect performance in sciences within Eldoret Municipality?

1.5 JUSTIFICATION OF THE STUDY

The problem of poor performance in science subjects in secondary schools in Eldoret Municipality has persisted for along time. This needs to be checked because in this era of information technology and other technological inventions and advancements, it is imperative that learners perform well in sciences as they form the foundation for many important career fields. Careers such as medicine, engineering, pharmacy, agriculture and information technology are among those that require a good foundation in sciences. Eshiwani (1986) stated that schools in Kenya have failed to adequately provide the needed scientific and technological manpower for development and hence, research is needed to find out why this situation exists and what can be done to improve the quality of science and technological education.

Professionals in these fields are in short supply yet they are required in adequate numbers for the well- being of the people and the economy of the country. For instance,

the ratio of doctors to patients in the country is very low. Likewise, we do not have enough pharmacists to manage chemists and to manufacture drugs locally, hence the heavy reliance on imported drugs. This gives rise to the mushrooming of quark doctors and pharmacists who thrive in areas where their services are required because there are no genuine practitioners. The field of engineering is no exception. We are yet to have as many Kenyan owned engineering firms as there are law firms. The Standard newspaper of 6th September 2008 reported that at a meeting of African Ministers for Education in Johannesburg, the ministers concurred that the ratio of students in natural sciences, engineering and medicine to that in commerce humanities and social sciences is too low. Subsequently, Africa has the least number of scientists and engineers per population in the world. We are also lagging behind in information technology due to lack of manpower in this field. This being the case, anything or anyone who can help to find solutions to the poor performance in science subjects and increase the number of students enrolling for science based careers in universities and colleges is of great significance.

This is the aim of this research. It will help to reach the roots of the problem of poor performance in sciences and come up with suggestions for improvement basing on the findings.

1.6 SIGNIFICANCE OF THE STUDY

The findings of the study can help to establish ways in which schools can put whatever resources they have to the best use to improve performance in science subjects. Learners will identify causes of poor performance and find solutions to those within their means. It will also help the Teachers Service Commission (TSC) and Boards of Governors (BOG) in deciding who should head schools in order to bring about all round

success in the institutions. The government will use the findings to put in place measures to standardize resources in all the schools. Quality Assurance and standard officers will use the information in advising heads of schools and teachers on leadership styles and teaching methods respectively. The overall benefit will be improvement of not only sciences but also in all the other subjects. It will also help the Ministry of Education in initiating appropriate training programs for head-teachers and science teachers. Last but not least, it will help the head teachers to evaluate their leadership styles and efficiency.

1.7 SCOPE OF THE STUDY

(a) Area scope

This study was done in Eldoret Municipality in Uasin Gishu district, Rift Valley province of Kenya. Eldoret town is 310 kilometres to the North West of Nairobi, along the Nairobi-Uganda highway. The study involved gathering information on performance in science subjects in secondary schools in the municipality. Of the 21 secondary schools that had presented candidates for KCSE by the year 2005, the top seven and bottom seven as per the ranking of the 2005 KCSE were involved in this study.

(b)Time scope

The proposal for study was written in 2006 and presented for defence on 7th December 2006.The field study was done in 2007. A letter of authorization to carry out research was obtained from the ministry of science and technology on 31st January 2007.The researcher then presented the letter to the District Commissioner and District Education Officer of Uasin Gishu District and

finally to the Municipal Education Officer who then gave a letter of authorization on 7th February 2007, allowing the researcher to conduct research from 8th February 2007 to 30th September 2007. Piloting was done in two schools in Trans Nzoia District in February 2007.The data from the pilot study was analysed and the findings used to make amendments to the data collection instruments to make them as valid and reliable as possible. Collection of data from the selected schools in Eldoret Municipality was done between March and April 2007.The data was analysed and the first draft presented for examination by July 2007.

1.8 LIMITATIONS OF THE STUDY

(a) The topic was sensitive especially in the low performing schools where one could be mistaken as being on a fault finding mission. This is because it required probing for inner details about schools, which could be misconstrued as witch-hunting. To overcome this, the researcher did not just post questionnaires but visited the schools physically asked for the principals' permission to conduct the research in their schools. The researcher explained about the research to the principals' and in the process developed rapport, hence opening a way for the principals to be interviewed.

(b) Some Head teachers' and teachers' reluctance to avail records and offer support during interviews or observation of facilities.

This plus failure by some respondents to return questionnaires were taken care of by

having two extra schools included in the sample. This increased the response rate.

1.9 ASSUMPTIONS

The study made the following assumptions:-

(i) That all the respondents were willing to answer the research questions

(ii) That headteachers and teachers would be free to discuss performance of their students.

(iii) That some schools perform poorly in sciences while others perform well.

(iv) The performance index measures the true performance of students.

1.10 THEORETICAL FRAMEWORK:

In this study, the researcher investigated factors influencing performance in science subjects in the KCSE exam basing on the systems theory by Ludwig Von Bertalanffy (1928), whose application to organisations was proposed by Katz and Kahn (1966). A system is a collection of interrelated parts, which form some whole. There are two types of systems. These are closed and open systems. Closed systems are self-supporting and do not interact with their environment. According to Cole (1993), open systems, on the other hand interact with their environment on which they rely for obtaining essential inputs and discharging of their outputs. Katz and Kahn (1966) considered organizations as systems. Likewise, this study considers schools as organizations, hence they are systems. Since schools depend on and interact with their environment, they are open systems. A basic model of an open system is diagrammatically shown in Figure 1.1

Figure 1. 1 A Basic Model of a System Based on Systems Theory

Source: Management, Cole (1993)

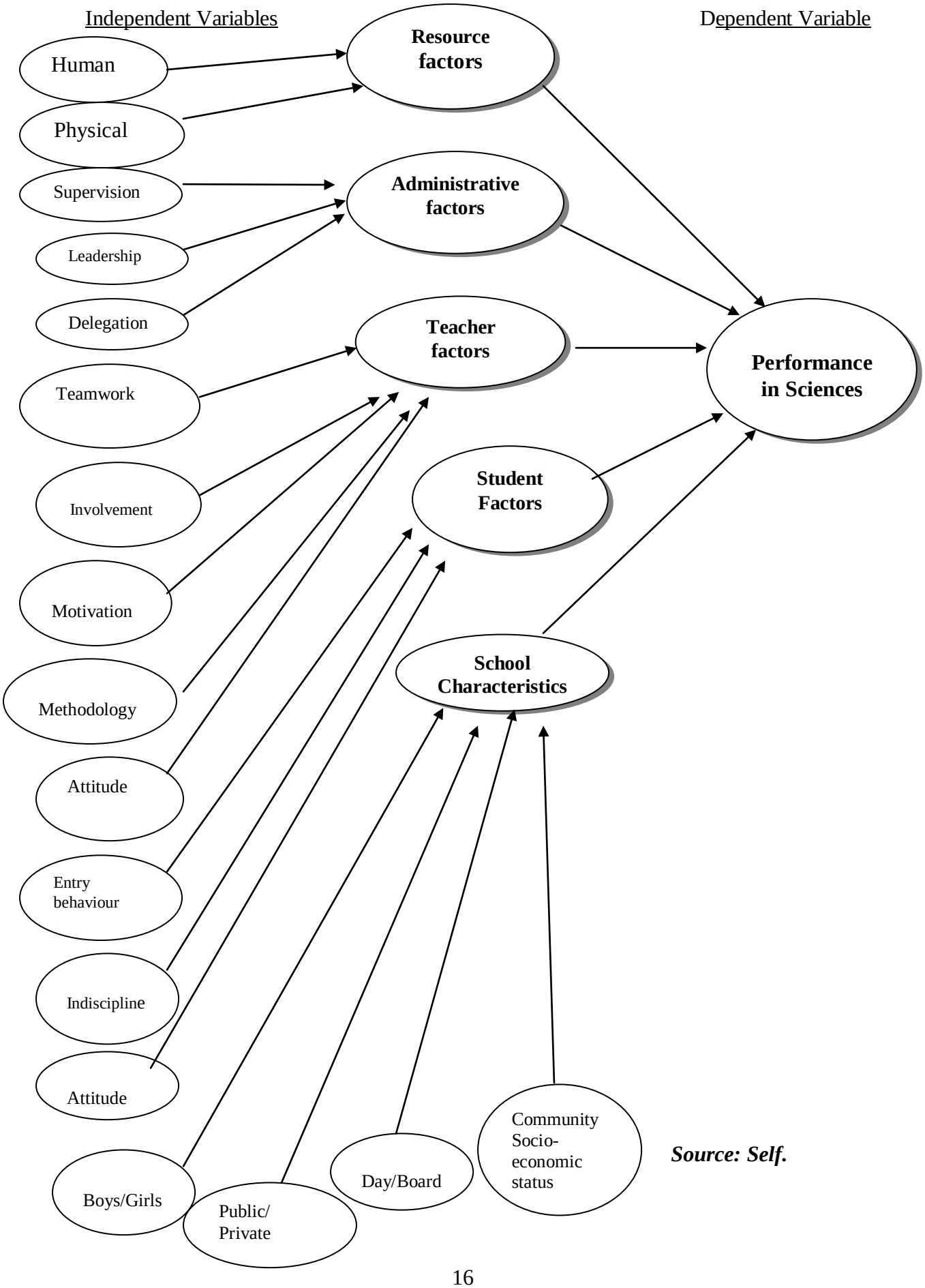
In relation to organizations (schools included), the inputs include people, materials, Information and finance. These are organized and activated so as to convert human skills and raw materials into products, services and other outputs, which are discharged into the environment.

There is great inter-dependence between the system and its environment (Koontz, 1998). Likewise the components of the organization are inter-dependent (Cole, 1993). Therefore, if anything goes wrong in the environment or any of the subsystems, the other subsystems will be affected and this will affect the outputs. Likewise, inputs greatly determine the outputs. Relating the above argument to the school system, the science department can be considered as a subsystem within the school. The school has several other subsystems. These include the administration, finance, procurement, academic, discipline, guidance and counselling, catering and welfare among others. Performance in science subjects is part of the outputs of a school system, and is therefore, affected by, not only what goes on in the science department, but also, in all the other departments.

Thus, basing on the idea of the systems theory, the researcher intends to find out how factors within the science department and other departments in the school, together with the school environment, interact to determine performance in the science subjects. The environment includes the community in which the schools are located and from which the learners and teachers are drawn. This entails the social, cultural, physical, climatic

and even economic status of the surrounding. The Ministry of Education, the Teachers' Service Commission and Kenya Institute of Education also affect performance as they determine policies, staffing and the curriculum. Figure 1.2 illustrates how performance in science is the outcome of the operations of a school as a system.

Figure1. 2 Conceptual Model of Linkage between Systems Theory and School Performance in Science.



Source: Self.

1.11 DEFINITION OF TERMS

Head teachers' qualification: Head teacher qualification refers to the level of education, the subjects he/ she teaches and the number of years one has taught.

High performing schools refers to schools within Eldoret Municipality which were ranked among the top seven and had an average mean score in KCSE sciences above 5.0 on a scale of 1-12 for the period 2001-2005.

Kamukunji- refers to an open forum where people discuss issues and problems freely.

Low performing schools refers to schools within Eldoret Municipality which were ranked among the bottom seven and had an average mean score in KCSE sciences below 3.5 on a scale of 1-12 for the period 2001-2005.

Performance - Performance as used in this research refers to the average of the grades scored in the KCSE science examinations for the period 2001-2005 in Uasin Gishu district.

Science - The term here is limited to the subjects, biology, chemistry and physics as taught in form one to four in Kenyan secondary schools.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 INTRODUCTION

The subject of poor performance in science is by no means an emerging issue. It is as old as education itself. Hence, many researchers and writers have written about this social phenomenon with an aim of helping to solve the problem. This chapter is an exploration of such early works on the topic. The review is based on the following sub topics:

- Overview of the factors affecting performance in science
- Head teacher factors-qualification and qualities, leadership style, supervision, decision- making, staff utilisation.
- Availability of resources
- Motivation
- Teacher factors-teaching methods, teacher qualification, competence, and development
- Attitude of teachers and students to science
- Gender influence
- School type
- Guidance and counselling
- School social-economic status

-

2.2 FACTORS AFFECTING PERFORMANCE IN SCIENCES

While writing about factors that affect performance in mathematics and science, professor Eshiwani (1982) said that achievement in science is determined by availability of resources. This being the case, one would expect that when these resources are available, the performance would automatically be high. However, this is not the case. Oyier (1984), cited by Kizito (1986) commenting on performance in KCSE in Kirinyaga District said that despite schools having qualified staff and permanent physical facilities, they do not perform well.

Among the factors that can cause poor performance in spite of a school being endowed, is the characteristics of a school head. These include the head teacher's qualifications and the style of leadership. Other factors, according to Kizito (1986) are: Poor preparation of pupils at primary level for science subjects in secondary schools, teachers with no science training whom during their school life detested the subjects being made to teach them, very few qualified and dedicated teachers and, a big workload yet teachers require more time for preparation. To this list, one can add other factors such as motivation, attitude, decision-making, discipline, guidance and counselling, relevance of the curriculum, the type of school, the environment and gender, among others.

Fonseca and Conboy (2006) found out that the quality of teaching and previous student preparation are the two major influencing factors of performance in Portugal. They also found out that one third of the students in their study did not think secondary science education prepared them for life in a scientific-technological world.

This perceived irrelevance of science thus contributes to failure. The researchers also reported that a culture of high expectancy on the part of teachers, parents and

administrators may be key in influencing rates of success. The sections below look into some of the above mentioned factors.

2. 2.1 Head Teacher's Qualification and Qualities

It has often been said that schools are as good as their head teachers. Sergon (2005) says that schools success depends on the head teachers. He says that a leader gets things done and has the ability to inspire, moderate, guide, direct and listen. These qualities are crucial for head teachers to be effective in their work. Managing a school is like charting a ship through turbulent waters.

According to Wekesa (1987), cited by Ngala (1997) , the process of certifying, recruiting, hiring and promoting teachers does not fully emphasize on teacher traits essential for classroom performance. This responsibility is left to the head teacher. However, Johnston and Sackney (1982) reported that principals might not do effective supervision due to lack of confidence, lack of knowledge and skills in clinical supervision and, lack of knowledge in curriculum and teacher effectiveness. This could not be truer for arts-based head-teachers inspecting science teachers.. For instance, a science-based head teacher will easily know which topics should be taught practically and expect to see this in the schemes of work, in class and in the record of work covered. An example of the effect of a head teacher's teaching subjects on performance in science is found in Mr. Gakumu, of Nguviu boys high school in Embu(The Standard,2005). Another example that shows that a science -based head-teacher is a blessing to the science department is the head-teacher of Kiambu High School, Mr. N. Mbugwa. He spends Ksh 300,000 per year to equip and maintain the laboratories, which rate as some of the best in the country (Daily Nation 2001).Apart

from his/her subjects, a head-teacher's credentials are important as they affect how the staff rates him/her.

Ndege (1997) quoted by Cheruiyot (2003) says that teachers are likely to perform well if they trust in their principal. A head teacher whose credentials have a biase for sciences stands a better chance of bringing harmony between the administrative wing and the science department, a factor that is essential for high performance.

2.2.2 Head Teachers Leadership Style

Koontz and Weihrich (1998) define leadership as the art or process of influencing people so that they strive willingly and enthusiastically toward the achievement of group goals. He adds that people should be encouraged to develop not only willingness to work, but also, with zeal and confidence. Several studies have been done about leadership leading to many theories. Many theorists have speculated that the secret to leadership problems lies in the style of the leader, the nature of the task, and the situation plus his personality (Rono, 2002). The leadership theories fall under three categories. These are: the traits theories, styles theories and contingency theories.

(a)Traits Theories:

These assume that the individual's qualities determine success in leadership. The traits according to Koontz and Weihrich (1998), include: physical traits, intelligence, personality drive and social traits. However, research findings have shown that not all leaders posses all the traits and, many non-leaders may posses most or all of them. Furthermore, there was no specification of how much of each trait a leader should have. Only 5 of the identified traits were found to be common. Thus, traits that lead to success of a leader differ depending on the situation. Stodill (1948) cited by Rono (2002) said that leaders exhibited certain characteristics such as intelligence,

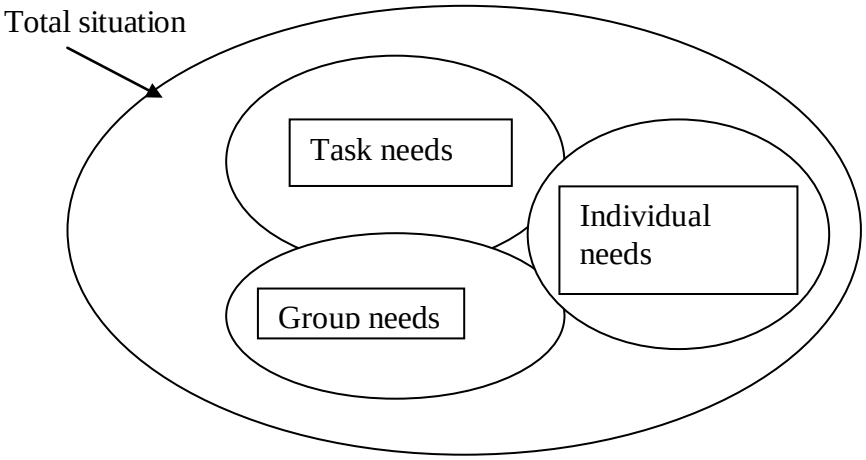
initiative, self-assurance and socio-economic position. Cole (1993) states that of all the traits which appear more frequently, intelligence, energy and resourcefulness are the most representative. A headteacher who possesses such traits is more likely to steer the school to produce good results.

(b)Contingency Theory

Fred Fiedler's model cited by Koontz (1998) suggests that group performance or effectiveness is dependent upon the interaction of leadership style and the extent of control the leader has over the environment (situation). He gives the situational variables as leader staff relations, task structure and position power.

The second key variable is the leader. Fiedler suggested two basic leader orientations, which are, relationship oriented (staff centred) and task oriented (task centred). In Fiedler's view, the leader- group relationship was most important. The Contingency concept of leadership was developed by Professor John Adair (Cole, 1993). His model of leadership incorporates concern for the task and concern for people. It further distinguishes the concern for individuals from concern for groups and stresses that effective leadership lies in what the leader does to meet the needs of the task, group and individuals within the prevailing conditions. In a school setting the task functions a head teacher needs to fulfil include planning, allocation of responsibilities and setting appropriate standards of performance. The group tasks include team-building for instance a formidable science department, motivation and communication while individual tasks include in-service and motivation. The diagram below shows Adair's mode.

Figure 1.3 Adair's Functional Model of Leadership



Source: Cole (1993)

(C) Style Theories:

Style theories consider leadership as an aspect of behaviour at work rather than personal qualities. (Cole, 1993). The theories are expressed in terms of authoritarian versus democratic styles, or people –oriented versus task oriented .The best known styles theories are:

(i) Authoritarian Democratic

(ii) The People-Task orientations

The authoritarian-Democratic theories include three approaches which are: D. McGregor's theory X and theory Y manager, the Rensis Likert's four management systems and the Tannenbaum and Schmidt's model. McGregor's theory X manager is tough, autocratic and supports controls with punishment –reward systems, hence authoritarian. On the other hand, the theory Y manager is benovelent, participative and believes in self controls, hence a democrat.

Likert's four management systems are: the exploitative-authoritative system ,which is the epitome of the authoritarian style; the benovelent-authoritarian system which is basically paternalistic style ; the consultative system which moves towards greater democracy and team work and finally, the participative group system which is the ultimate democratic style.

Tannenbaum and Schidtt's model is a continuum of leadership styles ranging from authoritarian behaviour at one end and to democratic behaviouat the other end.

The three approaches imply that managers have a choice between being either authoritarian or democratic and that the ideal is a democratic one. This then gives rise to the concept of leadership styles, whereby it is believed that people work harder under leaders who employ given styles of leadership. Leadership style refers to a particular behaviour applied by a leader to motivate staff to achieve the organizational objectives. The styles form a continuum and no single leadership style can be employed over a given situation. Likewise, leader success cannot be derived from leadership style alone, and this is where the contingency theory comes in. According to Leslie (1982), there are three styles of leadership:

a) Autocratic-a style in which the leader centralizes authority and relies on legitimate reward and punishment .
b) Democratic- the leader-delegates authority encourages participation and relies on expert and referent power to influence followers or workers.
c) Laissez fair-the leader allows members complete freedom to chart out the destiny of the institution. No leadership is provided.

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Pioneer studies conducted in Iowa State University by Kurt Lewin et al (1960), cited by Rono (2002) revealed that autocratic leaders performed highly, but only as long as they (leaders) were present to supervise. However, group members were displeased and hostilities usually developed. Democratic leaders were almost as good as the autocratic ones, but there was job satisfaction and workers needed less supervision (White and Lippitt, (1960) cited by Rono (2002). Due to participative leadership and decision-making in democratic leadership, there were more co-operation.

Orlosky et al (1984), cited by Ngala (1997) says: 'teachers will not optimize schools without help. It's collaborative and shared purpose that will bring about the achievement that schools are currently striving to reach". This being the case, one can confidently say that laissez fair leadership may not achieve much. Chubb and Moe (1990) say that leadership, personnel and practice are more important than either ability or socio-economic backgrounds in determining performance.

Sitima , a former chief inspector of schools said that there are a large number of schools with poor administration, even amongst most well established institutions in the country. It is here that low standards will be noticeable. This is the same thing Decenzo and Robbins (1988), and Fuller (1986) are referring to when they say that the type of management practices under which teachers work affects their productivity. Griffin (1994), commenting on leadership versus performance said that poor leadership results in poor discipline, which in turn causes poor performance. This study looked at type of leadership styles of the schools in relation to their performance in science.

The people-task orientation theories utilise two of the leadership variables, which are, the subordinates and the tasks. Approaches here include:

(i) The Michigan studies of 1950s which found that managers of high-producing groups tended to be employee centred while those of low-producing groups tended to be production centred.

(ii) The Ohio Studies of the 1950s which came up with the "consideration" and "initiating" structures. Consideration described behaviour that was relationships oriented or considerate of employees' feelings.Initiating structure referred to behaviour concerned with the organisation of work processes.

(iii) The 3-D theory by professor Reddin which lays emphasis on the effectiveness of relationship-oriented leadership and the task oriented leadership. The concept considers 3 dimensions of relationships and orientations which if used in appropriate situations lead to more effective leadership while if used in inappropriate situations lead to less effective leadership.

(iv) The Havard studies yielded two distinct groups of leadership which were mutually exclusive. These were, the task leaders and the social-emotional leaders. The task oriented ones showed concern for structuring activities while the social-emotional showed concern for supportive relationships.

In addition to the traits, styles and the contingency theories of leadership, there is the skills approach to leadership.

This refers to the skills that are essential for effective management. One study suggested three basic skills namely technical skills, human skills and conceptual skills (Landers and Myers 1985). A technical skill leads to ability to work proficiently while human skills enable one to work efficiently in a group. On the other hand, conceptual

skills enable one to see the organization as one whole unit. Katz (19550) states that human skills enable one to work with people, conceptual skills involve ability to work with ideas and concepts while technical skills refer to knowledge, competency and proficiency in a specific work or activity, for instance, the use of computers. Mbiti (1974) concurs when he says, a head-teacher, like a captain must be fully skilled in such things as official procedure, delegating duties, communication, human relations, and modern educational techniques so as to lead his team successfully in both curriculum and other matters. Commenting on the same, Orora (1997) says school managers need technical skills in the methods, processes, procedures and techniques of education, including specific knowledge in finance, accounting, scheduling, purchasing, construction and maintenance. Concerning human relations, school managers require self-understanding and acceptance as well as appreciation, empathy and consideration for others. The conceptual skills, on the other hand, entail effective mapping of interdependence for each of the components of the school as an organization. Relating this to performance in science, a head teacher needs to be acquainted with what goes on in the science department, work well with the science teachers and take note of all the factors that are related to and affect the science subjects.

2 .2 .3. Supervision.

The TSC code of regulations (1996) states that a head teacher is responsible for day-to-day assigning of duties and supervision of teachers. A head teacher needs to supervise science subjects, right from planning for instruction to classroom teaching, evaluation and reporting. According to Mbiti (1974), supervision concerns the tactic of efficient and proper management of personnel. But Eshiwani (1982) warns that it should be for the purpose of advising and not policing. In most schools, supervision is wanting.

Sarason (1982) says most principals spend most of their time on administration, housekeeping and maintaining order.

Kigamia (1986) concurs with this as he says that in Meru district, many head teachers spend more time with financial and business management than with curriculum instruction and supervision, as they are more preoccupied with fear of prosecution for financial mismanagement. This is understandable because there is no prosecution for underperformance in exams as one just gets a transfer or a demotion. Howel (1981) cited by Johnston and Sackney (1981) states that principals spend less than one fifth of their time on instruction-related activities and that majority of that time is spent on administrative behaviour such as scheduling and student placement. Implications of lack of supervision include: failure to scheme, no keeping of record of work covered hence poor syllabus coverage, and teaching of science subjects theoretically. These lead to poor performance in sciences.

2.2.4 Decision- Making, Team work and Delegation

Okumbe (1999) says that although educational organizations are bureaucratic, the teachers who occupy the bottom of the hierarchy are highly educated professionals, sometimes even more educated than the head- teachers. Thus teachers are supposed to be effectively involved in decision- making in their schools due to their specialized training. This could not be truer for science teachers. They are specialists in their subjects and their views and ideas should be held in high esteem by the head-teachers. For instance, when they say their workload should be reduced so as to leave them with some time for planning and conducting practical and, marking extra exercises, this should be taken seriously. According to Koontz and Weinhriich (1998), managers should be receptive and willing to give other peoples' ideas a chance. They further say

that decision-making involves some discretion and the subordinate's ideas may differ from the manager's. Therefore, the manager must not only be able to welcome ideas of others but also help them and compliment them on their ingenuity. Head teachers hesitate to involve the teachers especially in purchasing, as they do not want them to be privy to financial details of the school.

This is stated as one of the barriers to delegation by D'Souza (1989), which he states as follows: "Some matters l simply can't delegate". For others, it is a case of feeling insecure, especially if the teachers are assertive or more qualified than the head teacher (ibid). For instance, many school heads in Coast Province have diplomas while their teachers are Bachelor of Education graduates, some of whom have masters' degrees (The Standard, June23rd 2005). Orora (1997) quoting Waterman (1987) states that leaders must recognize that at some level of detail, the employee does know the job better. Accordingly, the person doing the job knows far better than anyone else the best way of doing that job and therefore is the person best suited to improve it. Head teachers whose schools are doing well have demonstrated that they know too well the significance of involving everyone in the search for success.

Gakii (2005) reports that the headmaster of Kamama secondary school said that he manages his work as a principal, president of the continental principals' organization and vice president of the International Principals' Organization by involving students, teachers and parents in decision-making. The head teacher of Nguviu Boys high school attributes his schools success to team work. He says that he uses the collective wisdom of the teachers and students as he believes that attitude is the driving force to success and everyone has potential (Thatiah, 2005). Likewise, the former director of Starehe Boys Centre, Griffin (1984) says that he held Kamukunjis with the students every

Friday to discuss all school issues. However, some head teachers fail to appreciate the role played by the teachers.

Lack of, or poor delegation in schools is a possible cause of poor performance in science subjects. Orora (1997) notes that in Kenya today, talents, skills and abilities of almost all the employees in most organisations lie fallow because of lack of, or inadequate involvement of staff members in task performance and decision-making. Consequently, productivity and employee satisfaction remain extremely low. Schools are no exception. If the head teacher over- delegates, under- delegates or fails to delegate to the head of department and science teachers, poor results could be the outcome. Studies have shown that many managers fail in their duties because of poor delegation.

Koontz and Weinhrich (1998) say that just in the same way one cannot do all the tasks in an enterprise necessary for accomplishment of group purpose, it is impossible for one person to exercise all the authority for making decisions in an enterprise. Orora (1997) adds that poor delegation makes the chief executive the only member of an enterprise. In addition, an enterprise' plans, decisions and tasks are enormous and any attempt by anyone to operate them singly leads to failure. Absence of a well structured science department where there is no teamwork and participatory decision-making and leads to poor performance.

2.2.5 Staff Utilization

There should be optimum use of the available teachers if good performance is to be achieved (Sessional Paper number 1 of 2005). Ngala (1997) says that where teachers are scarce, head teachers blame poor performance on this. But he cites Good (1989)

saying, it is clear that utilization of the resources available is more important than the quantity of resources. He further cites Fuller (1982) saying that the length of schooldays time spent on particular curriculum areas, and efficient use of instructional time within the classrooms, is more strongly determined by management practice than by material parameters. To this he adds what Mbiti and the former president, Moi said in 1980.That is, it is necessary to firmly enforce working hours in order to enhance productivity and avoid idling (Republic of Kenya 1980).

Wekesa (1993) says that the length of instructional day is positively related to performance. This is very crucial for science as evidenced by the allocation of more lessons in the Kenya Institute of Education (KIE) syllabus. Thus the head-teacher should ensure that the lessons are fully used. Santiago (1984) cited by Kizito (1986) said that some teachers have formed a habit of reading novels, newspapers and discussing current affairs during working hours. The head-teacher needs to ensure that the length of the instructional day is as planned in the school routine for all teachers.

Obwocha (2005, October 6) described a certain school as "the sick man of the national schools" as it is usually ranked at the bottom of the national schools in KCSE in spite of possessing adequate facilities and 74 teachers. Several Provincial and District schools trounce it. On the same note, Munyori (2006, March 9) says some national schools are a national shame. This was in reference to the poor performance of three schools that tailed in 2005 KCSE exam in the national schools category according to the results published in The Daily Nation and The Standard newspapers of March 2nd 2006.There cannot be a better example of the importance of optimum utilization of resources than that of the national schools that perform poorly. The poor performance illustrates the fact that it is not just what a school has that brings success, but also, how

the resources are used. Commenting on the issue, a new headteacher in one of the schools blamed the poor performance on lack of effective teaching and learning. He said that teachers and learners have been lax. He planned to end poor performance by in-servicing the teachers. Where teacher shortage exists in science subjects, the head-teacher and Board of Governors should hire on temporary basis, as there are very many trained but unemployed teachers.

2.2.6 Availability of Resources

These include: -human resource such as teachers and support staff and, physical facilities such as laboratories, libraries, classrooms and dormitories. Mbiti (1974) says that a head teacher needs to see that the necessary equipment and monetary resources are available for school use. In relation to science, he says that it must be taught through actual experiment with real objects. All scientific truths must be discovered through observation and experiment, not through telling. Reader's Digest March 2007) stated that words alone don't teach people... nor do they guide us with experience. Words alone aren't nearly enough. That's why we are doing things like organizing science expos, experimental workshops and teacher training, as well as providing books and science equipment. This was in reference to South African schools.

Unfortunately, in some schools in Kenya, Eldoret Municipality included, science is taught through talking and chalking, not through doing, due to absence of experimental objects (Wachira, 2007). Mbiti (1974) further states that when school equipment and supplies are delayed, teachers cannot be expected to do their work properly. Poor teaching will lead to poor performance by pupils in public exams. Thus poor administration procedure in supplying equipment results in poor quality work.

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Fonseca and Conboy (2006) posit that the physical conditions and organization of schools facilitate or inhibit construction of a culture of success. They noted that reasonable laboratory conditions and even class decoration can be an important element in improving student interest and achievement in science. In addition, they said that positive images of science through posters, news, stories, video presentations, projects and awards that present science careers as attainable and science knowledge as gateway to a better life could do the trick.

Little (1981) cited by Ngala (1997) says that in effective schools, teachers and administrators plan, design, research, evaluate and prepare teaching materials together and administrators allocate time and resources consistent with the priorities that have been announced. The Kenya Education Sector Support Program (2005-2010) cites mobilization, prioritization and utilization of resources as some of the problems facing mathematics and science subjects in secondary schools. Kathuri (1982) said there is relationship between utilization of resources and performance in Certificate of Primary Education (CPE). Fuller (1986) reported the same on studies in Uganda and Peru while Indoshi (1993) said the use of text books among other materials raises academic standards and efficiency of a school system. Eshiwani (1990) had the same finding. Ombari (1996) cites Combs (1985) and Sifuna (1989) who gave the same opinion.The need for course books and revision books in the ratio of 1:1 cannot be overemphasized if learners are to do extra work on their own. The Standard (2005) states that in the learning process, teaching and learning materials rank above uniforms, buses and buildings. A recent study in sub-saharan Africa shows that poor performances is due to lack of core textbooks (Ibid).

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Facilities such as dormitories and staff houses are also significant because if both learners and teachers reside in the school compound, lateness and missing of lessons is minimized. In addition, it is possible to arrange for extra and remedial lessons (MOE, 2003). Atieno (2000) found out that one of the factors causing poor performance in KCPE science in Bondo district was lack of transport which causes frequent absenteeism. This leads to less contact hours between teachers and learners. The Kenya Education Sector Support Programme (2005-2010) posits that boarding schools be established in arid and semi arid areas to improve access and performance in education. By extension, this also applies to performance in science. Since science practical require extra time, boarding schools make it possible to extend learning time to include evenings and weekends. Although resources are of great significance, Woessman (2001) says that though the international variation in student performance levels in mathematics and science is a fact, it is generally accepted that differences in the amount of resources does not fully explain why performance levels vary. Availability of adequate teachers and support staff is very essential. According to the Kenya Education Sector Support Programme (KESSP) of 2005-2010, teacher resource is one of the most important inputs into the education system. Fonseca and Conboy (2006) while quoting Ballone-Dura et al (2005) say that the science teacher has been found to be the most important factor in improving student achievement. Due to poor performance in science subjects, more Arts students than science students enrol into teacher training colleges and universities, leading to a shortage of science teachers (Sessional Paper number 1 of 2005).

Eshiwani (1975) quoted by Kizito (1986) says that the supply of science students for further training continues to remain inadequate with adverse effects upon manpower situation in science - based jobs. Shiundu and Omulando (1992) state that young and better trained teachers opt for better paying jobs elsewhere, hence the best of their

effort cannot be realised. According to the Kenya Times of 17th April 2006, the country was in need of 30 000 teachers then. It is imperative that schools are adequately financed and funded in order to do well in science subjects. Kuguru (1986) says that teaching of science is expensive due to the need to establish laboratories, the cost of apparatus, training of teachers and hiring of support staff. Schools, therefore, need a sound financial base.

Findings of the 'Third International Mathematics and Science Study' as reported by Woessman (2001) state that the level at which schools are funded affects performance. More responsibility for purchasing educational resources at national and local levels, leads to lower student achievement. Students performed better when responsibility for purchasing resources resided at an intermediate level. This is because an authority that is close enough to local schools to understand their needs, yet far away enough to avoid collusion between local officials and school employees is the best place to rest responsibility for funding education.

2.2.7 Motivation of Staff

Motivation is the willingness to do something and is conditioned by actions and ability to satisfy some need for an individual (Orora, 1997). Care and Cyril (1987) cited by Ngala (1997) say that good schools are characterized by high staff morale and standards. The fact that staff in some schools appears more enthusiastic and energetic than others is noticeable. What causes this? It's motivation. According to Orora (1997), signs of high motivation include high performance, consistent achievement of results, energy, enthusiasm and determination to succeed. These seem to be lacking in most schools in Eldoret municipality.

Adesina (1986) cited by Ngala (1997) says that productivity, behaviour and discipline of staff are influenced by the assessment of their economic worth as well as the extent to which their basic individual needs are met. This is basically similar to Maslow's hierarchy of needs. Hunter and Highway (1986) cited by Ngala (1986) say that head teachers should motivate teachers and not wait for the government to do this. Therefore one of the main roles of employers and head teachers is to motivate teachers to extend their time and energy at innovative effort. For instance, Lugulu Girls High School has 2000 shillings in its fees structure as a vote head for motivation (Lugulu High School Fees Structure 2006). Cheruiyot (2003) cites Leslie et al (1982) saying that the factors that supervisors need to provide/facilitate in order to motivate those under them include making work interesting, rewarding performance, providing rewards that workers value, giving individual attention, encouraging participation and co-operation and, providing timely feedback of information.

This is supported by Vroom (1960) quoted by Cole (1993) who said that people are motivated to work if they believe that their efforts will be rewarded and if they value the rewards that are being offered. Thus, head teachers should posses motivational skills to assess the value that teachers place on the rewards they are offered as some rewards may be viewed negatively. Tylor (1990) cited by Cole(1993) says that the output of a highly productive person would decrease when she/he discovers that he was receiving the same compensation as that of a person who produces less. Organising conducting practicals and supervising cleaning after the practicals adds extra work for science teachers especially where there is no laboratory technician. This calls for compensation from TSC and even from the school. Furthermore, since science teachers are few in most schools, they are overloaded. The government took cognisance of this in 1997 and introduced special subjects salary increments (TSC circular number 5/97 of 3rd

February 1997) and a special allowance for teachers of science subjects and other special subjects with effect from 1st July 1997(TSC circular number 13/97 of 24th November 1997).The aim of the increments was to encourage teachers to specialise in the areas as they were understaffed.

Currently, the government has done away with the special subjects allowance on grounds that there are now many teachers thus there is no longer a need to motivate more students to train in science subjects. This will have a negative impact as there is still a need to motivate the already trained teachers to teach their best.

Taylor (1947) designed a system whereby individuals are compensated according to their productivity. What then are the rewards? Mbiti (1974), Decenzo and Robbin (1988) say the rewards need not be financial only. The latter say the rewards should be based on efforts and performance while the former says an administration where the employee cannot hope to receive a word of commendation or sympathy from his supervisors at a time of need is inhuman and looks at employees as one of the many types of equipment necessary for running the organization. Paisy and Paisy (1987) cited in Ngala (1997) concur with these sentiments. At the school level a motivation scheme and a strong welfare structure would keep the teachers highly energised and productive.

Motivation could take the form of a promotion. Kiragu (1982) says promotion makes teachers work harder for higher achievements. The reward could be a higher salary. Cubb and Moe (1990) and Fuller (1986) say that there is a positive relationship between pupil academic achievement and teacher salaries (Cited in Ngala, 1997). This explains why private schools, which pay higher salaries and public schools that give rewards of various forms get better results as in the case of Lugulu above. According

to Moore (1968), it is essential to develop an overall program within which each package must be individualised.

Other rewards include public recognition as in giving certificates at organized district education days and trips to tourist sites in and outside the country.

According to Ivancevich (1983) incentive pay plans should be designed not only to reward good performance but also to minimise the negative side effects such as conflicts and grievances.

Apart from the motivation derived from anticipated rewards, head teachers, science teachers and learners need to have an inborn or natured great determination to succeed. For instance, the head teacher of Kianda School, while commenting on her school's performance said that teaching is a vocation that needs resilience and patience in moulding teenagers and that she was determined to keep her school at the top.(Wambogo, 2005). On the same note, the last words of the late Griffin to his Starehe boys would make a big difference in performance if heeded by head teachers, science teachers and learners. These were that the world is full of people who do their duties half heartedly, grudgingly and poorly. He thus urged his students not to be like them (The Standard, 2005).

Fonseca and Conboy (2006) said that motivation is associated with high achievement in Science. They said that students' perceptions of meaningfulness, challenge, choice and appeal of class activities were important .Hence, factors such as active learning, help–seeking and student effort were crucial. They reported that students who considered science important for their future and enjoyed learning achieved higher than those who thought science was irrelevant and difficult and only at school to please parents and

avoid had to look for a job. The need for praise and encouragement by teachers and parents was also identified. This study looked at the feelings of teachers about the level of motivation in their schools.

2.2.8 Teaching Methods, Teacher Qualifications, Competence and Development.

According to Mukwa and Jowi (1988**),** laboratory and practical work techniques are highly suitable for teaching agriculture, social and natural sciences. In this method, the cause, effect and nature of the learning activity are determined by actual experience or experiment under controlled conditions. Students therefore learn skills and acquire knowledge in a real life setting. Other appropriate teaching methods are demonstration and direct experience as they provide students with concrete experience of real life situations. On the other hand demonstration and informal lecture are vital as they allow exchange of points of views amongst students and between students and the teacher so as to arrive at collective decisions and conclusions (ibid).

This comes in handy after the laboratory and practical work**.** In their study, Fonseca and Conboy (2006) quoting Easton (2002) said that students in a residential high school in the USA were interviewed in order to determine perceptions of their learning needs. The needs they identified included personalized learning, teachers who care and active learning. They also quoted Wong et al (2002) who said that teacher behaviours that promote development of student autonomy were important. Another study by Tucker et al (2002) as quoted by Fonseca and Conboy (2006) analysed student generated solutions to enhance the academic success of African-American youth. Among them was praise and encouragement by teachers.

Fonseca and Conboy (2006) found out that the most important factor and, one of the most difficult to influence directly, is the quality of teaching. They said that learners readily recognize if their teachers are effective or ineffective, but education leaders may not be privy to the same level of knowledge of the competence of their teaching staff. Therefore, the only way to know and control the quality of the teachers is by stringent hiring and evaluation mechanisms. However, these mechanisms may be subject to extraneous influences which weaken their efficacy. Thus, teachers may be hired for the wrong reasons and may be retained, or even promoted for motives unrelated to teaching proficiency. The situation in Kenya is not different as is evidenced by the problems and complaints that arise from the decentralized hiring of teachers. The four years of pre-service training do not make teachers completely competent in pedagogy and subject content (KESSP 2005-2010, Sessional Paper number l of 2005). If one adds this to the fact that there are inherent weaknesses in systems of hiring and assessment of teacher effectiveness, the promotion of professional development activities becomes paramount for the improvement of teaching quality (Unpublished Paper By The 2005 students of Master of Philosophy in Education Administration). Staff development optimizes productivity (Schun 1986), cited by Ngala (1997).The chairman of the Kenya Federation of Employers once said that management should involve development of people, not direction of things (Republic Of Kenya 1980). Re-training could take the form of seminars and workshops.However, some head-teachers do not send teachers for such seminars and workshops due to the financial constraints. Atieno (2000) found out that one of the causes of poor performance in KCPE science in Bondo Division is the failure of all teachers to get a chance to attend in-service courses. Shiundu and Omulando (1992) state that in-

servising of teachers helps to acquaint the teacher with the latest innovations in curriculum hence enables them to cope with new demands.

There is an ongoing in servicing course (INSET) named Strengthening of Teaching Mathematics and Science in Secondary Education (SMASSE) with assistance from JICA (KESSP, 2005-2010). However, the project has encountered problems of discontent from teachers over allowances and poor living conditions at the training centres (Kamau, 2005) the paper states that there were reports of teachers walking out of SMASSE training programmes. There have been sit-ins and threats of boycotting in some districts. The teachers also feel that the training will not make a difference if the other factors affecting performance are not addressed. (MOE-SMASSE Inset Report (2005 0, Uasin Gishu District). This impacts negatively on the training, as it is not taken seriously. For instance, some teachers report and sign in the morning and take off, then come back in the evening to sign out. Due to this discontent, there may not be much enthusiasm in putting whatever they learn into practice.

The findings of Woessman (2001) revealed that higher training of teachers added more points to students' in science compared to teachers who had only secondary education. A bachelors degree was found to add 12 more points while a masters or doctorate increased by 32 points in science. The current study leave provision to teachers has encouraged many of then to pursue further studies. Those with diplomas are enrolling in degree programmes while those with degrees are enrolling for masters. However, the latter group does so with an aim of seeking employment elsewhere as TSC does not give a substantial salary increment to those with masters or doctorate degrees. It is as if they are considered too qualified to teach in high school. The Daily Nation (2007, July 10) shows the teachers' new pay package and indeed there is no mention of a scale for

teachers with post graduate qualification. If Woessman (2001) findings are representative, then the government should consider paying teachers with qualifications above the bachelor's degree salaries that are commensurate with their qualifications so that they do not seek employment outside TSC.

This would also motivate more teachers to undertake further studies. Kenya Union of Post Primary Teachers has this as one of their grievances against the government. They question why primary teachers who undertake degree courses are promoted to the next grade while the same is not extended to graduate teachers who undertake postgraduate studies.

2.2.9 Attitude of Teachers and Students to Science Subjects

A study by Shumbo (1993) found out that teachers' influence was a possible reason for impoverished attitudes towards science. The study found out that secondary school teachers in Harare lacked material teaching resource to use for hands on enquiry. This leads to poor understanding of the subjects. Hence the notion that the subjects are difficult arises, leading to a negative attitude. Science subjects are generally believed to be tougher than the humanities. Some learners and even teachers therefore believe that one has to have special abilities in order to do science (Fonseca and Conboy (2006) and, Kenya Education Sector Support Programme 2005-2010).

The former found out in a research in Portugal that difficulty of content was ranked third among factors that students considered as causes of failure in science while the latter states secondary mathematics and science subjects face problems such as negative attitude (of teachers, learners parents and education managers). Some teachers discourage learners by telling them that science is not for every Jack, Dick and Harry (Litala, 2006). Mayeske (1970) said that a teacher's attitude influences

pupil's attitude towards the subject. One who shows them that the subject can be done and encourages them achieves better than one who gives them an impression that the subject is tough. The case of negative attitude by education managers can be illustrated by what a director of Kenya Institute of Education once said that it is possible to teach science without students performing experiments and this would save parents and the government the cost of school laboratories (The Standard , 2007).The same paper states that in many countries, the study of sciences is optional, and where it is taught, low academic achievement is seen hence there are not enough skilled teachers in Africa. Thus almost all Africa universities are steeply skewed towards the humanities. This also applies to Kenya because in the 7-4-2-3 education system, some students would opt for the Arts and only do the compulsory sciences at ' O ' level then proceed to 'A' level for purely Arts combinations. For this reason, there were more Arts students than science students proceeding for higher learning. At the time, mathematics, physics and chemistry (MPC) combination was referred to as 'the mad peoples' combination', which bore the connotation that for one to do those subjects, one had to have intelligence that is so high that it borders insanity. This tended to alienate sciences from learners who considered themselves not so clever. The situation has not changed with the 8-4-4 system.

The sciences form the second cluster of subjects from which students are expected to choose either tw

table 2.1 illustrates this.

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Table 2. 1 A comparison of The Number of Students Who Enrol for The Three Science Subjects in Selected Schools In Uasin Gishu District.

School name	Entry	Physics	Biology	Chemistry
Chepkoilel	16	1	15	16
St. Mary Osorongai	11	1	11	11
Sambut	30	2	28	30
Eldoret Magereza	39	2	38	39
Tuiyo	12	3	9	12
Rurigi	24	4	20	24
Chepkongony	34	5	29	34
Kesses	70	6	70	70

Source: -Uasin Gishu District KCPE and KCSE Result - education Day Edition, 2004

This grim scenario can, however, be improved if the proper strategies are employed. Fonseca and Conboy (1999) report of a study in which an intervention was adopted on physics students fraught with negative attitudes and repeated failure. Results of the intervention showed that continuous engagement of students within meaningful contexts in a supportive environment (characterized by personal commitment on the

part of the teacher, high teacher expectancies and clear objectives and policies) can improve performance. This could be the case in two schools in Eldoret municipality which, not only enrols all their learners for physics, but also, get high mean scores as shown in the table 2.2. Another example is that of Thomas Edison-the father of modern physics. It is said that he was expelled from school because after three years he could not read or write. But at home, with encouragement from his mother, he was not only able to read and write but became an outstanding inventor with more than 1000 patents to his name. (The Standard, 2006).

Table 2. 2 Physics mean grades for two schools in Eldoret municipality

Year	2005		2004		2003		2002		2001	
School	Entry	Mean	Entry	Mean	Entry	Mean	Entry	Mean	Entry	Mean
Mother Of Apostles	83	8.154	81	8.154	82	8.1538	-	-	-	-
Moi Girls High School	170	7.906	121	7.934	125	7.896	121	9.460	119	6.343

Source: District Education Office Uasin Gishu District (2006)

Njuguna (1998) in a study in Kigumo division found that there is a significant positive relationship (r=0.22, n=148) between students attitude towards physical science and their academic achievement in this subject. An earlier study done by Daramola (1982) in Nigeria revealed that students taking physics had a positive attitude to it while those not taking it had a very negative attitude to it. The former attributed their positive attitude to the fact that they knew physics was a requirement for their choice careers. The latter said their negative attitude was due to the fact they found physics very difficult. Hence the kind of attitude determines whether students opt for a subject and put more effort in studying it.

Kizito (1986) quoting Comber and Keeves says that only those students who have the interest and excel in sciences should be encouraged to study it to the end. This would ensure efficient utilisation of the few available resources and improve performance.

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2.2.10 Gender Influence

On average, boys tend to do better than girls in science subjects (Reform Agenda for Education Sector In Kenya 2003 and The Standard, 2006). A UNESCO report on this states that performance at KCSE has remained below average in science, mathematics and technical subjects and that the performance of girls is lower than that of boys at all levels of education. Some people attribute this to natural causes in the genes. However, this can be refuted basing on evidence from the excellent performance of girls in the national schools and others such as Bahati, Lugulu, Precious Blood and Kianda girls schools (The Standard 2006). Ayodo (2005) reports that girl who scored a straight A in physics in Bunyore Girls High School in 2004 said she has proved that women can also do well in the subject. She said that all it took was discussions, being attentive, asking questions, reading ahead of the teacher, setting and marking her own exams, studying up to 11.30pm and, last but not least, belief in herself. However, she added that the well equipped laboratories and library and, the excellent school programmes that ensured syllabus coverage contributed to her success. She therefore asserts that science is not a male domain.

Bernstein and Peggy (1997) say that low achievement by women is not caused by genes but by factors in their environment. For instance, girls in mixed schools do not perform as well as those in single sex schools. This can be attributed to factors such as intimidation, sexual harassment and preoccupation with boy-girl relationships. This could be one of the reasons that led to the splitting of Nakuru High into two schools on gender basis .According to the standard (2004), teachers biases against girls contributes to poor performance in sciences. It states that teachers discriminate against girls in the way they teach, comment, and ask questions. And prefer to teach boys in the belief that boys are more capable and willing to learn than girls. The UNESCO publication known as

"Education Today" states that being a scientist is one of the most stereotyped occupations and this creates a barrier for more girls to be attracted to science (The Standard 2005). The stereotyping in turn causes girls to development of the attitude that science is for the boys.

Bunu (1985) found out in a study in Nigeria that males in general held a more positive attitude to science than females. Hammersley and Woods (1984) state that although physical science and biology are normally available to both boys and girls at school, at the upper secondary level, one third of the girls do not do science at all and over a half do not do physical science beyond the third year. This is thought to be to be caused by socialisation whereby children are sensitised to different orientations related to gender roles in societies. For instance, the view that science causes are masculine becomes reinforced where more boys are taking science and more men are teaching.

2.2.11 Type of School and its Influence on Size, Resources and Entry Behaviour of Students

Type of school is used in reference to whether the school is a national, provincial or district school as per the classification of the public (government) schools.

The other category is the private schools, which can also be grouped into the high cost elitist and the low cost ones.

The national schools, the exclusive private academies and some provincial schools are generally big and have excellent facilities in adequate amounts, which are a pre requisite for good results in science subjects (Sessional Paper Number 6 Of 1988 On Education And Manpower Training For The Next Decade And Beyond-Kamunge Report). Orodho (1996) said there is a positive relationship between instructional resources and achievement in science. On the other hand, some provincial schools and

most district schools are small and lack some of the essential facilities and even human resources for teaching science subjects. The same applies to the poor private schools like the back street commercial ones in urban centres(Reform Agenda for Education Sector in Kenya 2003).Those who enrol in such schools do it for the sake of tasting secondary education and most do not really expect to make it further (ibid). Simiyu (1984) cited by Kizito (1986) says that if the government could give the same priority treatment to both rural and urban schools by supplying equipment on time, rural schools could compete favourably with urban schools. According to Kizito (1986) schools need to be large enough to provide a reasonable range of subjects and employ specialists to teach them. Small schools assign staff members two or more subjects of curious combinations. Teachers get frustrated and this spills over to learners who then lose interest in the subjects and perform poorly.

Entry behaviour of learners is influenced by the type of school in that national schools select the top KCPE scorers followed by provincial schools then district schools. Due to their higher ability coupled with the conducive learning environment, those in national schools perform well in sciences. Reform Agenda for Education Sector in Kenya (2003) refers to this as elitism in education because majority of students admitted into national schools come from rich educated families that are able to enrol them into expensive private primary schools that are out of reach for the poor who are, therefore, out competed.

2.2.12 Guidance and Counselling, Discipline Versus Performance in Science Subjects

There could not be a better example of the effect of good discipline on performance than that provided by Starehe Boys Centre. The former director, the late Griffin instilled a high sense of discipline and responsibility into staff and learners. Griffin (1994) says

that poor management by head teachers leads to indiscipline which in turn leads to poor results. Another example of high achievers where discipline reigns is Kabarak high school which is said to have a strong guidance and counselling team consisting of seven male and seven female teacher/counsellors. In addition they invite external speakers fortnightly (The Standard 2005). They have never striked or threatened to do so.

On the other hand, Sergon (2005) reports that Njoro Boys High School has featured in news for indiscipline cased such as drug abuse, brothel visits and general defiance to teachers. Hence as expected, they hardly feature in the list of the top performing schools.

2.2.13 The School Community's Social-Economic Status

This refers to the cultural, educational and financial situation of the community in which the school is situated and from which learners and teachers are drawn. The teaching and learning of science subjects requires plenty of re sources, some of which are expensive. Education is neither an exclusively private nor public good, making its provision by both the government and private players a necessity (Reform Agenda for Education Sector in Kenya 2003). While the government's effort to fund education is under strain due to the high budget, leaving it to purely market forces is likely to result into uneven provision and access by different socio-economic groups. Thus its financing encompasses the central and local government, the private sector, NGOs, households, communities and external partners (Sectional Paper No.1 of 2005 on A Policy Framework for Education, Training and Research). Schools need support and cooperation from both the parents and the community. Thus schools that are situated in poor neighbourhoods with students from poor families may not have access to the necessary infrastructure (like electricity) and other facilities due to poor fee payment and lack of community support.

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According to Reform Agenda for Education Sector in Kenya 2003, implementing the cost sharing policy when parents were still struggling to meet the increased education costs caused by the implementation of the 8-4-4system was ill advised. This is because the different economic endowment of regions and even social groups was bound to cause disparities in terms of access and quality of education since not all groups could marshal resources on an equal footing. Furthermore since fees typically contributes between 91% and 100% of the financial sources available (Mwiria and Igbu (1999), quoted from Reform Agenda For Education Sector In Kenya 2003) non payment leads to some schools failing to meet some of their financial obligations such as provision of teaching and learning materials. According to Orodho (1990), there is appositive and significant relationship between parent's social-economic status and pupils' achievement in science. Onyango (2005) reports that a child whose parents are highly educated, of high social – economic status and are involved in parents' teachers' association (PTA) are likely to do better than those whose parents are not.

Woessman (2001) states that the education level of parents is strongly positively related to students' educational performance. Students whose parents completed secondary (or higher) achieved considerably more than students of parents who finished only primary school. It further states that the effect of a family having more books at home was even stronger than that of the highest educational level of the parents. Performance of students increases steadily as you go from students having fewer than 10 books at home to those having more than 200 books. Those with more than 200 books scored 54 points better than those with less than 10 books.

Kizito (1986) says that the attitude of parents to schooling and science subjects affects performance. He says that if parents believe in education and support the school in its

efforts and, if their aims are similar to those of teachers, then their children will have an advantage over those who come from homes with less enthusiastic parents. He cites Kapila (1980) whose study in some schools in Nairobi found that children whose parents made frequent visits to schools did better than those whose parents did not pay such visits. However, such visits are hampered by several factors. These include illiterate or semi-illiterate parents who are ignorant of the benefits of such visits, high transport costs and poor reception by the school.Fonseca and Conboy (2006) found out that parental involvement boosted learners' and established that there is a correlation between parental involvement, teacher expectancies and existence of support mechanisms in the school. The three therefore interact to enhance achievement.

According to Runo (2001), a Kenyatta University lecturer and a consultant in educational psychology, environmental deprivation and malnutrition contributes to learning disabilities. She said that children deprived of learning requirements at home and school experience learning problems.

2.3. SUMMARY OF THE CHAPTER

This chapter has explored the literature on factors that are considered to influence the performance in sciences at secondary school level. The chapter has explored the theoretical foundation of the study based on the general Systems Theory (GST) and related studies on factors affecting performance in sciences. The literature revealed that earlier researchers and writers found factors that influence performance in science subjects to be leadership, supervision, resources, motivation, decision-making, staff utilisation, attitude to science gender, type of school, quality of teaching, discipline and social economic status of the school community among others. This study differs from those reviewed in the literature in two ways. These are:

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- In none of the previous studies did the significance of a laboratory technician stand out like it did in this study.

- The notion that private schools outperform public schools was discounted by the findings of this study.

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CHAPTER THREE

3.0 RESEARCH DESIGN AND METHODOLOGY

3.1 INTRODUCTION

This chapter discusses the research design and methodology that was used in this study. The chapter discusses the research design, the study area, population and the sample used in the study. The sampling procedures, data collection and analysis procedures are also described.

3.2 RESEARCH DESIGN

This study employed the ex-post facto survey design. Burroughs (1971) states that the strategy, sampling and analysis considerations make up the notion of design. He further states that conducting research on all members of a population is expensive in terms of money, time and manpower. Hence a sample of the population is used instead and in this case, the research design employed is sample survey. Kerlinger (1983) describes ex-post facto design as one where the researcher selects rather than manipulates the independent variables. Hence this research was ex- post as the researcher identified the existing variables and found out, then described the relationships that existed between them, without direct intervention. The dependent variable was performance while independent variables were administrative, teacher, student, school and community characteristics. The survey aspect is in the sense that a sample was used.This survey design offered the following advantages

- It enabled the researcher to describe situations in the schools relating to the teaching/ learning of science subjects and also enabled exploration and explanation of phenomena about the schools.

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- It yielded quantifiable data that was computed in order to answer the research questions.

- It is the best method for collecting original data for the purpose of describing a population too large to be observed directly (Mugenda &Mugenda 1999)

However sample survey design has the following limitations:

- Errors can arise in data collection and recording due to dishonesty and prejudice especially where research assistants are involved but not trained. For instance, wrong sampling procedures could give rise to a sample that is not representative (Kothari, 1990). Mugenda and Mugenda(1999) add that such erroneous data which may arise due to dependence on the cooperation of respondents makes the study flawed.

- Information unknown to the respondents cannot be tapped.

- Requesting information considered secret and personal encourages incorrect answers.

- Surveys cannot be used to forecast things to come.

3.3 STUDY AREA

The study was conducted in Eldoret Municipality in Uasin Gishu district which is the Rift Valley Province of Kenya.The town is 310 kilometres north west of Nairobi. A map of the municipality is provided in appendix ix. The town lies astride the Kapsabet-Ziwa road and the Nakuru Tororo road in such away that the two roads cross each other at the CBD, somehow dividing the municipality into

four regions. The schools selected spanned the whole region, hence the sample was representative. The municipality was selected for the study due to the poor performance in science subjects in majority of the schools.

3.4 POPULATION AND SAMPLE

The research was carried out in secondary schools in Eldoret municipality. There were twenty-one secondary schools that were presenting students for KCSE at the time of research in the municipality. A list of these is shown in appendix I. Of these, eleven (11) were private while ten (10) were public schools. The researcher purposively selected the top seven (7) and bottom seven (7) schools in the municipality based on the 2005 KCSE results ranking. All the Head teachers of the fourteen (14) schools were selected. Four science teachers were selected at random in each school as well as twenty two (22) pupils from each school to give a sample size of 56 teachers and 308 students.

3.5 SAMPLING TECHNIQUES

Both non probability sampling and probability sampling techniques were employed. Non-probability sampling was used in the deliberate selection of the top seven high performing and bottom seven low performing schools as per the 2005 KCSE results. The fourteen head teachers of the schools were also purposively selected.

Probability sampling was used to select 30 % of the science teachers and the form three students in each of the selected schools.

3.6 DATA COLLECTION INSTRUMENTS

Observations, questionnaires and content analysis were the methods of data collection. The researcher observed the available physical facilities for teaching/ learning science

subjects. The questionnaire was generated by the researcher and involved closed-ended and open ended questions. Some of the closed ended questions were scored on a Likert scale of 1 to 5 for responses such as strongly disagree to strongly agree. Basic demographic data was also collected on the teachers' age, experience, and qualification and teaching subject. Questionnaires were given to head teachers, teachers and students. (see appendices IV, V and VIl).The document analysis involved sourcing secondary data on results of KCSE for the period 2001-2005 which were obtained from the D.E.O.s office in Uasin Gishu and analyzed with regard to performance in the science (appendix II and III).

Observation was chosen as it lent itself well to the purpose of finding out the availability of physical facilities for teaching and learning science. Kothari (1990) gives the following advantages, which were also applicable to this research:

- It gives information without asking respondents hence subjective bias is eliminated.

- The information obtained relates to what is currently happening and is not complicated by post behaviour or future intensions or attitudes.

- It is independent of the respondents' willingness to respond hence less demanding of active cooperation of the respondents, unlike interviews and questionnaires.

However, observation method has limitations such as being time consuming and expensive since the researcher has to travel to all the sites of study. It also provides very limited information, hence there was need to use other methods of data collection to make up for such limitations.

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Questionnaire was used as the respondents were literate hence able to under stand the questions. Other advantages, also highlighted by Mugenda and Mugenda (1999) are :

- It enables collection of data from a large sample
- Responses are free from the researchers' bias as they are in the respondents' own words.
- The respondents have enough time to think and write the answers as opposed to the interview where an immediate response is expected.
- It enables gathering information from respondents who are not easily approachable.
- Since a large sample is reached the results are dependable, reliable and representative.

However the questionnaire has some disadvantages, some of which were encountered during this study. These are: Failure by some respondents to return questionnaires,partially filled questionnaires, ambiguous responses,lack of clarification where respondents do not understandand,ack of the opportunity to amend the questions once they are dispatched.

Content analysis was used to obtain and analyse KCSE science results .Schindler and Cooper (1999) describe it as a method which measures the semantic content or the "what" aspect of a message. The method was used because the data was readily available hence the researcher economised time and money as it was not tedious to collect. In addition; errors which arise during the study are easier to detectand correct. The fact that the method has no effect on what is being studied is also an advantage. Further more, this

method guards against selective perception of content, has provision for rigorous application of reliability and validity criteria, and, is amenable to computerisation. Disadvantage of the method include the fact that it is limited to recorded data and, it is difficult to ascertain the validity of the data since the information is already recorded.

3.7 RESEARCH PROCEDURE

The KCSE results for schools in Uasin Gishu district for the year 2005 were obtained from the district quality assurance and standards office (DQASO). From this, the schools in Eldoret Municipality were selected and their results extracted and then ranked. There was 21 schools. Their mean grades for biology, chemistry and physics were extracted and average calculated to obtain the dependent variable, performance in science shown in appendix iii.

The top seven and bottom seven schools as per the 2005 KCSE ranking of the municipality schools were selected for the research .The researcher visited all the schools to get permission from the principals so as to conduct research in their schools. Questionnaires for the heads of the schools were presented, some of which were filled immediately while some principals asked the researcher to pick the filled questionnaires later. The principals then handed the researcher over to the science teachers who assisted in distributing the student and teacher questionnaires to the selected participants .These were filled and picked at a later date. The teaching and learning facilities were observed and the information filled in an already made table. Prio to the field study, the instruments were piloted in two schools in Trans Nzoia district.

3.8 VALIDITY AND RELIABILITY OF INSTRUMENTS

3.8.1 VALIDITY

Validity refers to the extent to which an instrument measures what it purports to measure.(Mugenda, 1999).It is the degree to which results obtained from the analysis of the data actually represent the phenomenon under study. It can also be referred to as the accuracy and meaningfulness of the inferences which are based on the research results. To ensure the validity of the instruments, the researcher compared the instruments with the set objectives and ensured that all possible items necessary for measuring the concepts under study were included. The researcher also consulted widely and made use of professional advice from supervisors at the School of Education, Moi University, Eldoret.

3.8.2 RELIABILITY

Reliability refers to the degree to which measurements are free from error and, therefore, yield consistent results or data after repeated trials. To establish the reliability of the questionnaires, the researcher carried out a pilot study in two schools in Trans Nzoia District. These were Hillario-Wekhonye and ST Teresa's secondary schools. Ten science teachers and ten form three students filled questionnaires. Reliability was tested using Spearman-Brown Coefficient, also known as Spearman-Brown Prophecy Coefficient .This is used to estimate full test reliability based on split half reliability measures. The Pearson Correlation of split forms estimates the half test reliability of an instrument or scale. The Spearman-Brown Prophecy formula is then used to predict what the full test reliability would be, based on the half test correlations, as shown below:

rSB1=(K x r i j)/(1+ (k_1) ,where

rSB1=The Spearman-Brown split half reliability

r i j =The Pearson correlation between forms i and j

K=Total sample size divided by sample size per form (k is usually 2).

The instruments were split into two halves using the odd and even number criteria. Reliability was computed using the above formula. A reliability coefficient of 0.72 was obtained, which was high enough for the instrument to be considered reliable. According to Burroughs (1975), a correlation of 0.9 or more indicates a well constructed cognitive test, hence high reliability. The correlation 0.72 obtained for this research is fairly close to 0.9, hence the instruments were reliable.

3.9 DATA ANALYSIS

The researcher used descriptive statistics as well as inferential statistical methods. The descriptive statistics involved computation of frequencies and means. The inferential statistics used were t-test and correlation. T-test was used to show if there were significant differences between the means of the low performing schools and the high performing schools. Correlation was used to find out if any relationship existed between performance in K.C.S.E sciences results and the research independent variables at $p<0.05$ level of significance.

CHAPTER FOUR

4.0 DATA ANALYSIS, PRESENTATION AND INTERPRETATION

4.1 Introduction

This chapter presents the findings and interpretation of the data from a study of factors that contribute to the poor performance in science subjects in secondary schools within Eldoret municipality. The chapter is divided into eight sections. These are: Background information, measurement of science performance, relationship between resources and performance, administrative factors, teacher factors, student factors, school characteristics, and, summary of the chapter.

4.2 Background Information

This section presents demographic information on the participants. The sample for this study consisted of 14 secondary schools in Eldoret Municipality. All the 14 head teachers of these schools were purposively selected. A total of 56 teachers and 308 students were selected by stratified random sampling. The response rate of filled questionnaires yielded 12 (85.7%) head teachers, 49 (87.5%) and 285 (92.5 %) form three students. Preliminary analysis investigated the descriptive statistics to provide the sample characteristics, such as age, gender and type of school.

4.2.1 Head Teachers

The sample comprised of fourteen (14) head teachers. There were twelve (12) valid responses from the head teachers, of whom 11 (91.7%) were male. A sizeable portion 3 (33.3%) did not have any lessons assigned on the timetable. It was further observed that 6 (66.7%) had less than ten (10) lessons per week. The head teachers were asked to state their teaching experience and the data is presented in table 4.1

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Table 4. 1 Head teachers Teaching Experience

Head teachers Teaching Experience	**Frequency**	**Percent**
6-10 years	4	33.3
11-15 years	1	8.3
16-20 years	2	16.7
>21 years	5	41.7
Total	**12**	**100.0**

From the data it was noted that the sampled head teachers were a mixed blend of experienced and inexperienced teachers as 4 (33.3%) had less than ten years teaching experience, while 5 (41.7%) had over 21 years teaching experience.

The head teachers were asked to state their length of stay in the same station. The results are presented in table 4.2

TABLE 4.2 Head Teachers' Stay in Station

Head teachers length of stay in same station (years)		**Frequency**	**Valid Percent**
Valid	Years		
	1.00	1	10.0
	1.50	1	10.0
	3.00	1	10.0
	5.00	1	10.0
	7.00	2	20.0
	15.00	1	10.0
	27.00	2	20.0
	28.00	1	10.0
	Total	**10**	**100.0**
Missing System		4	
Total		**14**	

In terms of their stay in the station, out of the 10 valid responses, 6 (60.0%) had stayed in their stations for less than 7 years. There was a group of head teachers 3 (30.0%) who had been in the same station for between 27 and 28 years. This implies that most of the head teachers had stayed in their stations long enough to enable them master and successfully steer the schools to achieve good performance in science subjects.

4.2.2 Teachers

There were 49 teacher respondents, of whom 30 (68.2%) were male, suggesting that the teaching of sciences was a male dominated realm.

This presents a problem of lack of role models for female students in this field.

For instance, one of the schools had no female science teacher yet it is a mixed school.

The teachers were asked to state their teaching subjects and the data is presented in table 4.**3**

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Table 4.3 Teaching Subject by Department

Teaching Subject		**Frequency**	**Valid Percent**
Valid	Biology	24	53.3
	Physics	8	17.8
	Chemistry	13	28.9
	Total	**45**	**100.0**
Missing System		4	
Total		**49**	

Most of the teacher respondents, 24 (53.3%) taught Biology. It was not established easily why most of the respondents were teachers of Biology. This could be attributed to the fact many teachers have biology as one of their subject combinations since it pairs up with either agriculture, geography, chemistry or mathematics .On the other hand chemistry pairs up with only 3 subjects-biology, physics and mathematics, while physics pairs up with only 2 other subjects-mathematics and chemistry. The low number of physics teachers could be one of the factors that contribute to poor performance in the subject.

The teachers were asked to state their teaching experience and the data is presented in table 4.4 bellow:

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Table 4. 4 Teaching Experience of Science Teacher Respondents

Teaching Experience		**Frequency**	**Valid Percent**
Valid	<5 years	19	41.3
	6-10 years	14	30.4
	11-15 years	6	13.0
	16-20 years	2	4.3
	>21 years	5	10.9
	Total	46	100.0
Missing System		3	
Total		**49**	

The data suggests that most of the teachers 33 (71.7 %,) had a teaching experience of up to 10 years. The view that most of the teachers were fairly young and energetic though inexperienced was further confirmed from data on their age.

The teachers were asked to state their age and the data is presented in table 4.5

Table 4. 5 Age of Teacher Respondent in years by group

Age of teacher respondent		**Frequency**	**Valid Percent**
Valid	25-29 years	18	40.9
	30-34 years	9	20.5
	35-39 years	12	27.3
	40-44 years	1	2.3
	46-50 years	4	9.1
	Total	**44**	**100.0**
Missing System		5	
Total		**49**	

Out of the 44 responses, 27 (61.4%) were below 35 years of age thus suggesting that they were energetic to teach sciences.

However, due to their young age, many of them could be less experienced hence contributing to the poor performance in science subjects.

In response to a question on whether the teachers were trained or not, all the teachers (n=49) responded that they were trained teachers. They were further asked to state their highest level of educational and the results are presented in table 4.6

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Table 4.6 Teachers' Highest Level Education Attained (Qualification)

		Frequency	**Valid Percent**
Valid	Diploma in education	13	28.3
	Bachelor in Education	27	58.7
	Working on Masters in education	4	8.7
	Masters in education	2	4.3
	Total	46	100.0
Missing System		3	
Total		**49**	

It was noted that 13 (28.3%) had a diploma in education, 27 (58.7 %) had a bachelors degree in education, while only 6 (13.0%) were either working on their masters or had a masters degree in education.

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4.2.3 Students

There were 283 valid students respondents, whose gender was fairly balanced (54.6% male) and (45.4% female). The students were asked to state their favourite science subject and the data is presented in table 4.7.

Table 4. 7 Favourite Science Subject

Favourite Subject		**Frequency**	**.Valid Percent**
Valid	Biology	155	57.8
	Chemistry	56	20.9
	Physics	57	21.3
	Total	268	100.0
Missing System		15	
Total		**283**	

Most of the students, 155 (57.8%) said that their favourite subject was Biology. Physics was ranked second with 57 (21.3 %) while 56 (20.9%) stated that Chemistry was their favourite subject. The findings contradict the general feeling that physics is the most difficult hence the least popular as shown in table 2.1 on page 31. However the results also confirm the fact that where physics has been demystified and appropriate interventions put in place, high performance is possible as is the case in two schools in Eldoret Municipality (table 2.2).This concurs with the findings of Conboy and Fonseca (2006) which were as follows: "On a scale of 0 to 20 where 10 represented a passing grade, the score for chemistry and physics was 12.5 while that for biology was 13.4 "(p.85)

4.3 Measurement of Science Performance

In order to compute the variable 'science performance', data was analysed for the period 2001-2005 for the sample schools. The performance in each of the three science subjects was analysed and is as in appendix II .

The mean performance for the individual schools was as presented in table 4.8.

Table 4.8: KCSE Mean Performance in Sciences 2001-2005

	SCHOOL	2005	2004	2003	2002	2001	MEAN
1	64 SEC	2.543	2.787	2.38	2.397	2.61	2.54
2	ELD. SEC	2.383	2.075	2.683	2.237	.	2.34
3	ELD.MAGEREZA	2.799	3.585	.	2.974	3.272	3.16
4	ELDORET HARAMBEE	4.735	5.929	6.371	4.876	5.048	5.39
5	KAPSAOS	2.64	2.698	2.579	2.907	2.559	2.68
6	MOI GIRLS	9.11	9.03	8.802	9.175	7.91	8.81
7	MOTHER APOSTLES	8.521	8.4	8.646	.	.	8.52
8	MWIRUTI	3.603	3.406	2.873	3.682	3.15	3.34
9	P.G.C SEC	2.591	3.054	2.876	3.243	2.867	2.93
10	SAGE SEC	2.77	3.334	2.167	3.683	3.009	2.99
11	SIRIKWA	3.053	2.943	2.831	2.706	2.921	2.89
12	TESTIMONY	5.356	5.349	4.992	6.8	5.911	5.68
13	UASIN GISHU	7.533	7.356	6.207	.	.	7.03
14	WARENG	5.519	5.728	4.417	5.335	4.88	5.18

Source: Uasin Gishu District 2001_2005 Results (Editions for Education Day). The value computed for KCSE Mean was used in further analysis as the dependent variable for the study.

4.4 RELATIONSHIP BETWEEN RESOURCES AND PERFORMANCE IN SCIENCE SUBJECTS

The study sought to answer the first research question which states as follows:

"What is the influence of human and non-human resources for teaching science subjects on performance in sciences within Eldoret Municipality?"

4.4.1 Physical Resources

The student respondents were asked to state the availability of various teaching and learning resources in their schools and the data is presented in table 4.9

Table 4.9 Students Responses on Availability of Resources for Sciences.

	Texts available	**Revision Books**	**Labs Adequate**	**Lab stocked Chemicals**	**Lab stocked Equipment**
N Valid	273	268	272	269	270
Missing	10	15	11	14	13
Mean	3.16	2.50	3.31	3.36	3.33
Std. Deviation	1.488	1.378	1.621	1.473	1.486

On a Likert scale of 1=*strongly disagree* to 5= *strongly agree*, there students were generally undecided on the availability of textbooks, labs, laboratory chemicals and lab equipment. However, on the issue of revision books they were generally inadequate (M=2.50), suggesting inadequate usage of revision books. This necessitated an investigation of differences in availability of resources among the high and low performing schools and the data is shown in table 4.10.

Table 4. 10 Comparison of student responses on availability of teaching and learning resources in high and low performing schools

Teaching/learning resource	High or Low	N	Mean	Std. Deviation
Texts available	Low	130	2.69	1.499
	High	143	3.58	1.350
Revision Books	Low	126	2.26	1.285

	High	142	2.70	1.428
Labs Adequate	Low	129	2.36	1.551
	High	143	4.16	1.142
Lab stocked Chemicals	Low	128	2.70	1.549
	High	141	3.95	1.111
Lab stocked Equipment	Low	128	2.80	1.547
		142	3.80	1.256

The table shows a comparison of students' responses in the low and high performing schools to the question on availability of resources

From the data, there were differences in availability of resources based on students' responses. Availability of textbooks, revision books, lab chemicals and equipment was

higher in the high performing schools than in the low performing schools. Independent t-tests were conducted to explore the statistical significance of the differences between the high and low performing schools.

The results are presented in table 4.11 below:

Table 4.11 Independent Samples t-Tests on students' responses on availability of resources

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Texts available	Equal variances not assumed	7.354	.007	-5.126	260.67	.000	-.888	.173	-1.229	-.547
Revision Books	Equal variances not assumed	7.824	.006	-2.669	265.95	.008	-.442	.166	-.769	-.116
Labs Adequate	Equal variances not assumed	37.735	.000	-10.780	233.53	.000	-1.796	.167	-2.125	-1.468
Lab Chemicals	Equal variances not assumed	54.580	.000	-7.522	228.11	.000	-1.247	.166	-1.574	-.921
Lab Equipment	Equal variances not assumed	24.250	.000	-5.780	244.86	.000	-.998	.173	-1.338	-.658

-

Since the Levene's test of equality of variance was significant as the value was less than 0.05, equal variance was not assumed.

The significance levels of the t-test were all less than 0.05 ($p<0.05$) hence the t-test values obtained were significant implying that there were significant differences in the variables under test. The data suggests that there were significant differences in availability of textbooks, revision books, adequacy of laboratories, and the stocking of laboratories with chemicals and equipment. The largest t value was for adequacy of laboratories ($t_{(233.53)}=-10.750, p<0.05$),followed by lab chemicals ($t(_{228.11})=-7.522_{),}$ $p<0.05$), lab equipment ($t_{(244.86)=}$ $-5.780, p< 0.05$), text books ($t_{(260.67).} = -5.126, p < 0.05$) while the lowest value was for revision books ($t_{(265.95)}=-2.669, p<0.05$). This implies that the difference in performance in science between the two categories of schools could be as a result of the difference in adequacy of resources between them. The statistical significant difference in the high and low performing schools was also evident in that the lower and upper 95% Confidence Interval of the Difference did not cross zero line. Similar data from teachers was collected on the availability of teaching and learning resources and the data is presented in table 4.12 below:

Table 4.12 Teachers' data on availability of resources

	Laboratories available	Lab chemicals available	Lab Equipment available	Lab Assistant available	Reference Books available	Revision Books available
N Valid	41	38	41	41	41	41
Missing	8	11	8	8	8	8
Mean	3.63	4.00	3.76	3.12	3.73	3.73
Std. Deviation	1.670	1.356	1.496	1.720	1.484	1.342

Based on a Likert scale of 1=*strongly disagree* to 5= *strongly agree*, teachers generally agreed that resources were available. The availability of a laboratory assistant scored lowest (M=3.12) while availability of chemicals scored the highest (M=4.00).The 3.12 mean for lab assistant availability implies that there were some schools lacking this vital resource .This lowers performance because even if all the other resources are available, the teachers' ability to arrange for practical frequently is limited.

Cross-tabulation using performance as a criteria provided data as presented in table 4.13

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Table 4.13 Means of teacher response on availability of learning resources in Sciences

Science Resource	High or Low	N	Mean	Std. Deviation	Std. Error Mean
Laboratories available	Low	24	2.96	1.654	.338
	High	17	4.59	1.176	.285
Lab chemicals available	Low	22	3.41	1.469	.313
	High	16	4.81	544	136
Lab Equipment available	Low	24	3.04	1.488	.304
	High	17	4.76	.752	.182
Lab Assistant available	Low	24	2.63	1.663	.340
	High	17	3.82	1.590	.386
Reference Books available	Low	24	3.04	1.488	.304
	High	17	4.71	.772	.187
Revision Books available	Low	24	3.25	1.359	.277
	High	17	4.41	1.004	.243

-

The data suggests that there were differences in availability of teaching/learning resources between the high performing schools and low performing schools. Teachers in high performing schools generally agreed (M=4 and above except for lab assistant whose mean was 3.83) that resources were adequate. On the other hand, teachers in low performing schools either disagreed (M=2) or were undecided (M=3). This necessitated exploring for the statistical significance of the implied differences.

The results are presented in Table 4.14.

Table 4. 14 Independent Samples Test on Teachers Responses on the availability of Teaching/Learning Resources

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std.Error Difference	95% Confidence Interval of theDifference	
									Lower	Upper
Laboratories available	Equal variances not assumed	12.949	.001	-3.688	38.994	.001	-1.630	.442	-2.524	-736
Lab chemicals available	Equal variances not assumed	38.217	.000	-4.110	28.257	.000	-1.403	.341	-2.103	-.704
Lab Equipment available	Equal variances not assumed	30.527	.000	-4.861	35.876	.000	-1.723	.354	-2.442	-1.004
Lab Assistant available	Equal variances assumed	.785	.381	-2.314	39	.026	-1.199	.518	-2.246	-.151
Reference Books available	Equal variances not assumed	27.672	.000	-4.663	36.262	.000	-1.664	.357	-2.388	-.941
Revision Books available	Equal variances not assumed	5.652	.022	-3.147	38.902	.003	-1.162	.369	-1.908	-.415

-

The data suggests that there were significant differences in availability of textbooks ($t_{(36.262)} = -4.663$,$p < 0.05$), revision books ($t_{(38.902)} = -3.147$, $p<0.05$) adequacy of laboratories ($t_{(38.994)} = -3.688$) p<o.o5), availability of laboratory assistants ($t_{(39)} = -2.314$,$p<0.05$) the stocking of laboratories with chemicals($t_{(28.257)} = -4.110$, $p=0.05$) and equipment($t_{(35.876)} = -4.861$), $p=0.05$) between the high performing schools and the low performing schools .

This data was used in correlation analysis to establish if there was any significant correlation between KCSE performance in sciences and the availability of physical and human resources from the teachers' responses.

The results are presented in Table 4.15.

Table 4.15 Correlations on KCSE performance and Availability of resources

		KCSE MEAN	Laboratories available	Lab chemicals available	Lab Equipment available	Lab Assistant available	Reference Books available	Revision Books available
1.KCSE MEAN	Pearson Correlation	1						
	Sig. (2-tailed)	.						
	N	49		10				
2.Laboratories available	Pearson Correlation	.478(**)	1					
	Sig. (2-tailed)	.002	.					
	N	41	41	10				
Lab chemicals available	Pearson Correlation	.462(**)	.832(**)	1				
	Sig. (2-tailed)	.004	.000	.				
	N	38	38	38				
Lab Equipment available	Pearson Correlation	.436(**)	.614(**)	.792(**)	1			
	Sig. (2-tailed)	.004	.000	.000	.			
	N	41	41	38	41			
Lab Assistant available	Pearson Correlation	.134	.321(*)	.531(**)	.478(**)	1		
	Sig. (2-tailed)	.405	.041	.001	.002	.		
	N	41	41	38	41	41		
Reference Books available	Pearson Correlation	.533(**)	.444(**)	.412(*)	.420(**)	.336(*)	1	
	Sig. (2-tailed)	.000	.004	.010	.006	.032	.	
	N	41	41	38	41	41	41	
Revision Books available	Pearson Correlation	.286	.390(*)	.458(**)	.527(**)	.610(**)	.679(**)	1
	Sig. (2-tailed)	.070	.012	.004	.000	.000	.000	.
	N	41	41	38	41	41	41	41

** Correlation is significant at the 0.01 level (2-tailed)

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

The data suggests that there were significant correlations between KCSE performance in Sciences and availability of laboratories (r=.478, p<0.05), availability of chemicals (r=.462, p<0.05), availability of laboratory equipment (r=.436, p<0.05) and availability of reference books. This agrees with the earlier findings where there was a relationship between availability of resources and achievement in science (Fonseca and Conboy,2006). and Orodho (1996) .

Availability of revision books (r=0.286, p>0.05) and availability of lab assistant (r=0.134, p>0.0.5) were not correlated with performance in sciences. This contradicts the finding of Indoshi (1993) who stated that the use of text books among other materials raises academic standards. The contradiction is probably due to my small sample size

4.4.2 Human Resources

Human resources that were considered were laboratory assistants and teaching staff.

(a) laboratory assistants

Availability of laboratory assistants was dealt with in table 4.12 (page 50) which shows responses of teachers to the question on availability of resources. On a Likert scale of 1=strongly disagree to 5=strongly agree, availability of laboratory assistants scored the lowers t(m=3.12).On this scale ,3=undecided. This can be interpreted to mean that some schools had laboratory assistants while others did not. On the basis of low and high performing schools, the mean for low performing schools was 2.639 (between disagree and undecided) while that for high performing schools was m=3.82 (between undecided and agree).This generally means more high performing schools had laboratory

assistants than low performing schools. This could translate to greater ease and higher frequency of performing experiments in the higher performing schools than in the low performing schools.

Information obtained from questionnaires on adequacy of resources concurred with what was observed as per the observation schedule shown in table 4.16 below.

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LE 4.16 Observation Sheet For Teaching/Learning Resources

	RESOURCES	**SCHOOL**												
		1	2	3	4	5	6	7	8	9	10	11	12	13
1	**Presence of laboratory (yes/no)**	No	no	yes	yes	yes	Yes	yes	yes	yes	yes	yes	yes	Yes
2	If yes, how many	-	-	1	1	1	1	1	5	2	2	3	3	2
3	Laboratory Equipped	-	-	-	-	-	Yes	-	yes	yes	yes	yes	Yes	Yes
4	Laboratory Not fully equipped	-	-	yes	yes	yes	-	yes	-	-	-	-	-	-
5	**Laboratory Technician(s) yes/no)**	-	-	no	-	-	No	no	5	1	1	2	3*	2
6	**Presence of library(yes/no)**	No	No	no	no	no	no	no	yes	yes	Yes*	yes	Yes	Yes
7	Library Equipped	-	-	-	-	-	-	-	yes	yes	yes	yes	yes	yes

Key: School numbers

1-7 Low performing schools. :8-13 High performing schools

3*-Three technicians plus several trainees yearly.

5* Has 5 laboratories plus a museum

Yes* Has both a library and a book store

The table shows that 2 out of the 7 low performing schools did not have a laboratory. All the 5 low performing schools that had a laboratory lacked laboratory technicians and only one of them was fully equipped. In addition, none of the low performing schools had a library. On the other hand, all the high performing schools had more than one laboratory. The laboratories were fully equipped and there was at least one laboratory technician. All the 7 schools in this category had a well stocked library.

(b) Adequacy of Teaching Staff

Head teachers were asked if they considered the staff establishment adequate for the sciences. Their responses are given in the table below;

TABLE 4.17 Adequacy of Teaching Staff

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	3	21.4	25.0	25.0
	Yes	9	64.3	75.0	100.0
	Total	12	85.7	100.0	
Missing System		2	14.3		
Total		**14**	**100.0**		

The table shows that most schools, 9 (75%,) had adequate staff to teach science subjects effectively. Thus the poor performance in the municipality must be due to other factors other than inadequacy of staff. The researcher sought to find out adequacy of staff among low performing and high performing schools and obtained the information in the table below on next page.

Table 4.18 Adequacy of Staff in the Low and High Performing Schools

	Adequate	Inadequate	Total
Low	6	1	7
High	3	2	5
Total	9	3	12

The table shows that out of the 7 low performing schools, only one had inadequate teachers, confirming that proper utilisation of the resources available is more important than the quantity of resources (Ngala-1997 and Kizito-1986).On the other hand, 2 out of the 5 high performing schools reported inadequacy of science teachers. The two head teachers were asked how they coped with the shortage to produce good results. They said they hire B.O.G. teachers and ensure that the available teachers work extra time to meet the set targets. This there means that adequacy and proper utilisation of staff is essential for good performance in since.This concurs with the findings of Ballone-Duran, Czemiak&Haney,(2005) who, as cited by Fnseca &Conboy(2006) stated that the teacher has been found to be the most important factor in improving student achievement.

4.5 ADMINISTRATIVE FACTORS

The study sought to investigate the relationship between performance in sciences and the administrative factors in the sampled schools. This was in order to provide answers to the second research question which stated:

> *"What is the effect of specific administrative factors of: head teachers' qualifications, experience, leadership styles, degree of supervision, delegation, teamwork and involvement of teachers in decision-making on performance in sciences within Eldoret Municipality?"*

4.5.1 Delegation

The teachers were asked to state their response to an item "*delegation of academic duties is done effectively*" and the data is presented in table 4.19 below.

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Table 4.19 Teachers response on effectiveness of delegation of academic duties

		Frequency	**Valid Percent**
Valid	Strongly Disagree	2	5.0
	Disagree	5	12.5
	Undecided	4	10.0
	Agree	20	50.0
	Strongly Agree	9	22.5
	Total	**40**	**100.0**
Missing System		9	
Total		**49**	

Out of the 40 valid responses 29 (72.5 %) agreed that delegation of academic duties was done efficiently.

There was general agreement to this statement on delegation (M=3.73, SD=1.109). However, correlation of delegation and KCSE performance in sciences indicated that

there was no significant correlation (r=.056, p=.730). This implies that delegation is not a key factor in determining performance in science and contradicts the findings of Orlosky et al (1984), that it is collaborative and shared purpose that brings achievement in schools. This also differs with the feelings of Orora (1997),D'Souza 1989) that poor delegation leads to failure. An independent-samples t-test was calculated comparing the mean score of schools identified as high performing schools and schools identified as low performing schools. No significant difference was found ($t_{(38)} = -.115$, $p>0.05$) in the means of this item between the high performing schools and the low performing schools.

Table 4.20: Group Statistics on Teachers' Response on Delegation of Academic Duties

The table shows information on whether teachers' feelings about delegation of academic duties in low performing schools differed from those of teachers in high performing schools.

	High or Low	N	Mean	Std. Deviation	Std. Error Mean
Delegation of academic duties are done efficiently	Low	24	3.71	1.197	.244
	High	16	3.75	1.000	.250

The mean for the low performing schools (M=3.71, SD=1.197) was not significantly different from the mean of the high performing schools (M=3.75, SD=1.000).This implies that delegation of duties is done in more or less the same way in the two categories of schools and cannot therefore account for the differences in performance.

4.5.2 Teamwork

The respondents were asked to state their response to an item " *teachers work as a team in the teaching of sciences*". There was a general agreement that teachers worked as a team (M=4.07, SD=.787). Indeed 34 (82.9.0%) agreed or strongly agreed with the statement. A spearman *rho* correlation coefficient was calculated for the relationship between teamwork and performance in KCSE sciences. A weak correlation that was not significant (r=. 232, $p>0.05$) was found. Thus teachers' perception of their teamwork was not related to performance in sciences at KCSE. This implies that teamwork was not a major factor among those that affect performance. This contradicts Ngala (1997) who said that in effective schools, teachers and administrators plan, design, research, evaluate and prepare teaching materials together and administrators allocate time and resources consistent with the priorities agreed upon.

An independent-samples t-test was calculated comparing the mean score of schools identified as high performing and those identified as low performing schools. No significant difference was found ($t_{(39)} = -1.113$, $p>0.05$) in the means of this item between the high performing schools and the low performing schools.

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Table 4.21 Data on Teachers' Responses to the Statement: 'We teachers do work as a team in the teaching of sciences

The table shows the means for high and low performing schools**.**

High or Low	N	Mean	Std. Deviation	Std. Error Mean
Low	24	.96	. 859	. 175
High	17	4.24	. 664	. 161

The mean for the low performing schools (M=3.96, SD=.859) was not significantly different from the mean of the high performing schools (M=4.24, SD=.664).This shows that the two categories of schools apply more or less the same degree of teamwork. Hence it is not the cause of the difference in performance in science between them.

4.5.3 Involvement in Decision Making

Teachers were asked to state all the people involved, first in the planning for requisitions and secondly, in the actual purchase of science materials and equipment. The results are presented in Table 4.22. below

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Table 4.22: Teachers' responses on who is involved in planning and purchasing of science materials and equipment

	Involvement in Planning for Purchases				Involvement in actual Purchases			
	HM alone	Teachers	HOD alone	Lab Assistant	HM alone	Teachers	HOD alone	Lab Assistant
Valid	12	24	15	18	21	14	10	14
Missing	37	25	34	31	28	35	39	35

The results suggest that there are cases where the Head teacher does not involve the teachers in planning and actual purchases of science materials. This item had poor responses from teachers as seen from the number of missing cases. This could be attributed to the fact that some answers to this question could easily be misconstrued as complaints, criticism or personal attacks on the head teachers' way of handling financial matters. The missing cases could also imply indifference to the issue, that is, why talk of things that don't concern me (things I'm not involved in)?

A second item asked the teachers to state their response to the statement "*I am involved in decision making on matters pertaining to the teaching of sciences".* The results are presented in Table 4.23 below.

-

Table 4. 23 Teachers responses on their involvement in Decision making on matters pertaining to teaching sciences.

		Frequency	Valid Percent
Valid	Strongly Disagree	2	5.0
	Disagree	5	12.5
	Undecided	3	7.5
	Agree	21	5 2.5
	Strongly Agree	9	22.5
	Total	**40**	**100.0**
Missing System		9	
Total		**49**	

The table shows the teachers' responses to the question 'l am involved in decision in making on matters pertaining to the teaching of sciences',

on a Likert scale of strongly disagree=1 to strongly agree=5 .

Most of the teacher respondents, 30 (75.0%) either agreed or strongly agreed with this statement, implying that most of the teachers were involved in decision making on matters pertaining to the teaching of sciences. This agrees with the findings on the leadership style in table 4. 35 where most of the teachers, 30 (71.4%) stated that their head teachers practised participative leadership. The means for the high performing schools and low performing schools were obtained and compared as shown below in table 4.24.

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TABLE 4.24 Group Statistics

The table shows means of responses of teachers in low performing schools and those in high performing schools about the statement:

I Am Involved In Decision Making On Matters Pertaining To The Teaching Of Sciences

High or Low	N	Mean	Std. Deviation	Std. Error Mean
Low	24	3.71	1.233	.252
High	16	3.81	.911	.228

The table shows that the mean for low performing schools (M=3.71) was not very different from that of the high performing schools (M=3.81).An independent samples test was done and the results are given in table 4.25.

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Table 4.25 Independent Samples Test For 'I am involved in decision making on matters pertaining to the teaching of sciences'

The table shows the outcome of a t-test of responses for involvement in matters of teaching science.

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower
Equal variances assumed	1.487	.230	-.289	38	.774	-.104	.360	-.834	.626
Equal variances not assumed			-.307	37.520	.761	-.104	.339	-.791	.583

The table shows that no significant difference was found ($t_{(38)= \_ .289,\ p>}$ 0.05 in the means of low and high performing schools. This therefore means that the difference in performance between the two categories of schools is not caused by the degrees of involvement of teachers in matters of teaching science.

A third item required teachers to respond to the statement "*I am involved in the requisition of science chemicals and apparatus".* The results are presented in Table 4.26.

Table 4. 26 Teachers responses on their involvement in Requisition of Science Chemicals and Apparatus.

		Frequency	**Valid Percent**
Valid	Strongly Disagree	4	9.8
	Disagree	3	7.3
	Undecided	6	14.6
	Agree	20	48.8
	Strongly Agree	8	19.5
	Total	**41**	**100.0**
Missing System		8	
Total		**49**	

Most of the teacher respondents, 28 (68.3%) either agreed or strongly agreed with this statement, implying that teachers were generally involved in requisition of science chemicals and apparatus. The researcher sought to find out if there were differences

between the low and high performing schools on this issue .Data on this is given in table 4.27 below.

Table 4.27 Group Statistics: I Am Involved in the Requisition of science chemicals and apparatus

High or Low	N	Mean	Std. Deviation	Std. Error Mean
Low	24	3.79	1.103	.225
High	17	3.35	1.272	.308

The table shows that there was a small difference between the means for low performing schools (M= 3.79, SD=1.103) and high performing schools (M=3.35,SD 1.272).Teachers in the two groups were generally undecided about this issue.

This implies that not all teachers are fully involved equally in the low and high performing schools, and this is likely to affect their enthusiasm in teaching. A t- test was done to determine if there was a significant difference between the high and low performing schools and the out come is shown below in table 4.28.

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Table 4.28 Independent Samples Test On: I am involved in the requisition of science chemicals and apparatus

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
	R				.			Upper	Lower
Equal variances assumed	.623	.435	1.178	39	. 246	.439	.372	-.315	1.192
Equal variances not assumed			1.149	31.381	259	.439	-382	.340	1.217

The table shows that there is no significant difference $t_{(39)=}1.178$, $p> 0.05$ in the means of the low and high performing schools in terms of involvement in requisition of science

chemicals and apparatus, implying that the difference in performance is not caused by this factor.

A fourth item required teachers to respond to the statement "*Lessons are shared in a democratic way where I am involved".* The results are presented in Table 4.29.

Table 4.29 Teachers responses on their involvement in sharing of lessons democratically.

		Frequency	**Valid Percent**
Valid	Strongly Disagree	1	2.5
	Disagree	4	10.0
	Undecided	5	12.5
	Agree	20	50.0
	Strongly Agree	10	25.0
	Total	40	100.0
Missing System		9	
Total		**49**	

Most of the teacher respondents, 30 (75.0%) either agreed or strongly agreed with this statement, implying that teachers were generally involved in decision making on the sharing of science lessons democratically. A comparison was made between the low and high performing schools and the data is show in table 4.30 below.

Table 4.30 Group Statistics:

Lessons Are Shared In a Democratic Way, Whereby I Am Involved

	High or Low	N	Mean	Std. Deviation	Std. Error Mean
	Low	24	3.75	1.073	.219
	High	16	4.00	.894	.224

Table 4.30 shows that the mean for high performing schools (M=4, SD= .894) was slightly higher than that for low performing schools (M=3.75,SD= 1.073) implying a higher degree of democracy on this issue in the former than the latter.

A t test was done to establish the significance of this difference .Data for this is shown in table 4.31 bellow.

Table 4.31: Independent Samples Test On:

Lessons Are Shared In A Democratic Way, Whereby I Am Involved

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Upper	Lower
Equal variances assumed	.589	.448	-.770	38	.446	-.250	.325	-.908	.408
Equal variances not assumed			-.799	35.993	.430	-.250	.313	-.885	.385

The table shows that there was no significant difference($t_{(38)}$ =0.770,P > 0.05) in the means of the low performing schools and high performing schools in relation to involment in sharing of lessons.

Correlation analysis of performance in KCSE sciences and the three concepts of involvement in decision making did not yield any significant correlation as lesson sharing(r=.092, p>0.05), decisions in sciences (r=.044, p>.05) and requisitions (r=-.074, p>.05) all had weak associations that were not significant.

The mean of the scales for Lesson sharing, Involvement in decision making and in requisition are presented in Table 4.32.

Table 4. 32 Group Statistics of means of involvement of teachers in decision making.

	High or Low	N	Mean	Std. Deviation	Std. Error Mean
Lesson shared	Low	24	3.75	1.073	.219
	High	16	4.00	.894	.224
Decision	Low	24	3.71	1.233	.252
	High	16	3.81	.911	.228
Requisition	Low	24	3.79	1.103	.225
	High	17	3.35	1.272	.308

The mean for “I am involved in decision making on matters pertaining to the teaching of sciences” and “Lessons are shared in a democratic way, whereby I am involved” were higher for the high performing schools than in the low performing schools. However for “I am involved in the requisition of science chemicals and apparatus” was higher for the low performing schools than in the high performing schools. This implies that teachers in high performing schools are slightly more involved in the three issues collectively compared to the low performing schools, hence the difference in performance.

Three independent-samples t-tests were calculated testing for differences in the three aspects of involvement in decision making between schools identified as high performing schools and schools identified as low performing schools. The results are presented in table 4.33.

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Table 4.33 Independent Samples Test of teachers responses on differences in involvement of teachers in decision making

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Lesson shared	Equal variances assumed	.589	.448	-.770	38	.446	-.250	.325	-.908	.408
Decision	Equal variances assumed	1.487	.230	-.289	38	.774	-.104	.360	-.834	.626
Requisition	Equal variances assumed	.623	.435	1.178	39	.246	.439	.372	-.315	1.192

No significant differences were found in the means of sharing of lesson ($t_{(38)}$ =-0.770, p>0.05), decision making($t_{(38)}$ =_ .289 p>0.05), and requisition($t_{(39)}$ = 1.178 p>0.05) between the high performing schools and the low performing schools. This implies that

these three factors are not among the factors that cause differences in performance in the low and high performing schools. This contradicts the findings of Orlosky et al (1984) who said that collaborative and shared purpose brings about achievement in schools.

4.5.4 Leadership style

The head teachers were asked to state their leadership style, whether they considered themselves as being task or people centred. The findings suggest that out of the 12 responses, there was divided opinion on their leadership style, with 6 (50.0 %) for each style.

An exploration of the correlations of leadership style and KCSE science performance did not yield any significant correlation (r=-.437, p=.155).

This then required further investigation of the differences in leadership style between the high performing schools and the low performing schools. An independent sample t-test yielded results as in Table 4.34.

Table 4.34 Independent Samples Test on Head teachers perceived leadership style

Leadership	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	.769	.401	1.195	10	.260	.375	.314	-.324	1.074

The results suggest that there were no significant differences ($t_{(10)}$ =0.195 ,p=.260) in the leadership style categorized as task or people centred between the high performing schools and the low performing schools. This implies that the difference in performance in the two categories of schools is not caused by the types of leadership. Similar data on leadership style was investigated from the teachers' responses.

The teachers were asked to state what they considered to be the leadership style of their head teachers based on a classification of participative, Leases fair and dictatorial. The data is presented in table 4.35.

Table 4.35 Frequencies of Teachers' responses on Perceived Leadership Style of their Head teachers

		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	Participative	30	61.2	71.4	71.4
	Leases fair	9	18.4	21.4	92.9
	Dictatorial	3	6.1	7.1	100.0
	Total	42	85.7	100.0	
Missing System		7	14.3		
Total		**49**	**100.0**		

Most of the teachers, 30 (71.4%) perceived that their head teachers used participative styles, while only 3 (7.1 %) stated that their head teachers were dictatorial. Correlation of leadership style on a scale of 1= *Participativ*e, 2= *Leissez fair*, 3= *Dictatorial* and the

performance in KCSE science yielded a correlation of r= -.356 ($p<0.05$) suggesting that as the leadership style moved towards dictatorial tendencies, the performance in science subject declined. Cross tabulation of the leadership style and the school classification based on performance produced data as shown in Table 4.36 below:

Table 4.36 Cross tabulation of High or Low performance and Leadership Style

High or Low	Leadership Style			Total
	Participative	Leases fair	Dictatorial	
Low	16	8	3	27
High	14	1	0	15
Total	**30**	**9**	**3**	**42**

The data suggests that the only dictatorial tendencies among the head teachers were from low performing schools; while for the high performing schools 14 (93.3%) of the teachers reported that their head teachers used participative styles. This would suggest differences in the leadership styles used.An independent sample t-test was conducted to explore this difference in leadership style and the data is presented in table 4.37.

Table 4.37 Independent Samples t-Test of Teachers Responses on the Perceived Leadership style of their Head teachers.

	Levene's Test for Equality of Variances		t-test for Equality of Means						
Leadership Style	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances not assumed	28.551	.000	3.006	36.255	.005	.452	.150	.147	.757

An independent-samples t-test was calculated comparing the leadership style used by the head teachers of schools identified as high performing schools and schools identified as low performing schools. A significant difference was found ($t_{(36.255)} = 3.006$, $p<0.05$) in the means of this item between the high performing schools and the low performing schools. This implies that leadership styles are one of the factors that affect performance as well as causing differences in performance in the two categories of schools.

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It confirms the findings of Decenzo and Robbins (1988), and Fuller (1986), who said that the type of management practices under which teachers work affects their productivity. It also confirms what Griffin (1994) said, that is, poor leadership results in poor discipline, which in turn causes poor performance.

4.5.5 Head teacher's qualifications

The study further sought to investigate the relationship between the head teacher's qualification and the performance in science subjects. In response to an item on whether they were trained teachers or not, all the head teachers responded that they were professionally trained teachers. The head teachers' were further asked to state their highest academic qualifications. The results are presented in Table 4.38

Table 4. 38 Highest level of education attained by teachers

		Frequency	Valid Percent
Valid	Bachelors in Education	9	75.0
	Working on Masters in education	1	8.3
	Masters in education	2	16.7
	Total	**12**	**100.0**
Missing System		1	
Total		**13**	

All the head teachers had a bachelor's degree in education where by 9 (75 .0%) had the bachelors as their highest qualification while the rest were either working on their masters or had a masters degree.

Correlation analysis of highest education level and performance in science was done and the results are as shown in table 4.39 below.

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Table 4.39 Correlation Of Head teachers' and Performance In Science

5		**KCSE MEAN**	**Highest level of education attained**
KCSE MEAN	Pearson correlation		-0.141
	Sig.(2-tailed)	1	0.662
	N	12	12
	Pearson correlation	-0.141	1
	Sig.(2-tailed)	0.662	-
Highest level education attained	N	12	12

The table shows that the analysis did not yield any significant correlation(r=-0.141, p=.662) and the independent sample t-test also did not yield any significant differences ($t_{(10)=}$ .4972,p>.05) between the high performing schools and the low performing schools based on the head teachers qualifications. This implies that the head teacher's qualification is not a major factor in influencing performance. .

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4.5.6 Head teacher's experience and length of stay in the station.

The study further sought to investigate the relationship between the head teachers experience and the performance in science subjects. The results of a correlation between the headteachers' stay in the station and performance is shown below.

Table 4.40 Correlation Of The Headteachers' Stay In The Station And Performance

		KCSE MEAN	Stay in Station	Teaching Experience
KCSE MEAN	Pearsons Correlation Sig. (2-tailed) N	1 12	.313 .378 10	.172 .592 12
Stay in Station	Pearsons Correlation Sig. (2-tailed) N	.313 .378 10	1 . 10	.482 .158 10
Teaching Experience	Pearsons Correlation Sig. (2-tailed) N	.172 .592 12	.482 .158 10	1 . 12

The table shows that there was no significant correlation between the length of stay in the station(r=.313, p=.378) and teaching experience(r=.172, p=.592) with performance

in KCSE science subject. This implies that the head teachers' experience and stay in a station was not an important factor in influencing performance.

Independent sample t-tests was done and the results are shown in table 4.41 below.

Table 4.41.Independent samples t-Test of Teachers' Stay in The Station and Teaching Experience with Performance in Science

		Levene's Test for Equality of Variances				t-test for Equality	
		F	Sig	T	Df	Sig. (2-tailed)	Mean Difference
Stay in Station	Equal variances assumed	2.651	.142	-1.438	8	.188	-12
	Equal variances not assumed			-1.078	2.436	.376	-12
Teaching Experience	Equal variances assumed	.000	1.000	-1.047	10	.320	
	Equal variances not assumed				.994	5.362	.363

The table shows that there was no significant difference in the length of stay ($t_{(8)}$ =-1.438, p=.1880) and teaching experience ($t_{(10)}$ =-1.047, p=.320) among the high performing schools and the low performing schools .This contradicts what would be expected because as was said by Landers and Myers (1985) , Mbiti (1974) and

Orora(1997), a head teacher needs skills for effective management. One would therefore expect that the more experienced a head teacher is and the more he /she stays in a station the more skilful and better placed they would be to produce better results.

4.5.7 Head Teacher's Supervision of the Teaching of Science

The study also investigated the relationship between the head teachers' supervision and the performance in science subjects. The teachers were asked to state their response on an item "there is adequate supervision of sciences by the Head teacher". The data was scored on a Likert scale of 1=*strongly disagree* to 5= *strongly agree.* The findings are presented in Table 4.42.

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Table 4. 42 Frequencies of teachers' responses on adequacy of supervision by head teachers

		Frequency	**Valid Percent**
Valid	Strongly Disagree	4	10.5
	Disagree	7	18.4
	Undecided	7	18.4
	Agree	18	47.4
	Strongly Agree	2	5.3
	Total	38	100.0
Missing System		11	
Total		**49**	

Most of the teacher respondents,20 (52.7%) , m=3.18, sd=1.136 agreed that there was adequate supervision of sciences by head teachers. This contradicts the sentiments of Sarason (1982) and Kigamia (1986) that most head teachers spend more time on

supervision of financial and discipline matters than supervision of curriculum instruction. Correlation between the head teachers supervision and performance in sciences did not yield any significant correlation (r=-.113, p=.499). This contradicts the findings of Ngala (1997) .The former said that poor administration in well established schools in Kenya was the cause of low standards. The latter said that leadership, personnel and practice determine performance.

4.43 Group Statistics: Teachers' Responses To The Question On Supervision Of The Teaching Of Science By The Headteacher

	High or Low	N	Mean	Std. Deviation	Std. Error Mean
There is adequate supervision of teaching of sciences by the Head teacher	Low	22	3.18	1.181	.252
	High	16	3.19	1.109	.277

The mean for the low performing schools (M=3.18, SD=1.181) was not significantly different from the mean of the high performing schools (M=3.19, SD=1.109).

This means that many teachers in both low and high performing schools were generally undecided as to whether the supervision was adequate or not.

An independent-samples t-test of supervision by the head teacher was calculated comparing the mean score of schools identified as high performing schools and those identified as low performing schools. No significant difference was found ($t_{(36)} = -.015$, $p>0.05$) in the means of this item between the high performing schools and the low performing schools .This implies that the degree of supervision in the two categories of schools is not likely to be among the major factors causing a difference in performance in science subjects.

4.6 TEACHER FACTORS AND PERFORMANCE IN SCIENCES

The study further sought to investigate the relationship between teacher factors and performance in science subjects. This was in order to provide answers to the third research question which stated thus:

"To what extent teacher factors of do: attitude, motivation, experience, competence, and the methods of teaching affect performance in KCSE sciences within Eldoret Municipality"

4.6.1 Motivation

Two Likert scale items required teachers to state their views on the levels of motivation and the effect of financial emoluments on their delivery in the classroom. The items required respondents to answer the questions "*There is poor motivation which affects my classroom delivery"* and "*My employers' pay package demodulates me from giving my best"*. The results are presented in table 4.44

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Table 4.44 Teachers' Responses To The Item, 'Effect Of Motivation And Pay Package On Performance'.

Response	Motivation		Salary	
	Freq	%	Freq	%
Strongly Disagree	6	14.3	4	10.3
Disagree	10	23.8	2	5.1
Undecided	3	7.1	9	23.1
Agree	18	42.9	16	41.0
Strongly Agree	5	11.9	8	20.5
Total	**42**	**100.0**	**39**	**100.0**
System	7		10	
Total	**49**		**49**	

The table gives the frequency and percentage of the teachers' responses to the above question, on a Likert scale of strongly disagree =1 to strongly agree =5.

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Motivation scored a mean of 3.14 (SD=1.317) while Salary had a mean of 3.56 (SD=1.188). There were mixed views on the influence of motivation and salaries on their service delivery. However, 'agreed' and 'strongly agreed' if combined scored higher than the other three combined, for both motivation and salary, implying that a high number of teachers are demodulated and dissatisfied with their salaries. This could therefore be one of the factors that cause low performance. As Tylor (1960) put it, the 0utput of a highly productive person decreases when one discovers that he /she was receiving the same compensation as that of a person who produces less.

Further correlation of performance in KCSE, motivation, and salaries yielded data as in Table 4.45

Table 4.45 Correlations of performance in KCSE sciences, motivation and Salary.

		Science Performance	**Cause Motivation**	**Cause Salary**
KCSEMEAN	Pearson Correlation Sig. (2-tailed)	1		
Cause motivation	Pearson Correlation Sig. (2-tailed)	0.487(**) 0.001	1	
Cause Salary	Pearson Correlation Sig. (2-tailed)	0.223 0.173	0.168 0.306	1

** Correlation is significant at the 0.01 level (2-tailed).

There was a significant correlation ($r=0.487$, $p<0.01$) between performance in sciences and motivation indicating that as the motivation increased there was an improvement in KCSE performance in the sciences.

This concurs with the findings of Ngala (1997), that the productivity of staff is influenced by the assessment of their economic worth as well as the extent to which

their basic needs are met.. On the other hand, there was no significant correlation (r=_.223, p=0.01) between performance in sciences and financial emoluments. This can be attributed to the fact that the salary scales are the same for all the teachers in the low and the high performing schools.

The study sought to find out if there were differences between the low and high performing schools on the issues of motivation and salary and the data is shown in table 4.46 below.

Table 4.46 GROUP STATISTICS ON THE MEANS OF MOTIVATION AND SALARY

	High or Low	N	Mean	Std. Deviation	Std. Error Mean
There is poor motivation which affects my classroom delivery	Low	25	3.64	1.221	.244
	High	17	2.41	1.121	.272
My employers' pay package demotivates me from giving my best	Low	23	3.52	1.123	.234
	High	16	3.63	1.310	.328

The table shows that the mean for low performing schools with regard to motivation (3.64,SD=1.221) was higher than that for high performing schools

(2.41,SD=1.121),meaning that teachers in high performing school felt more motivated than those in low performing schools. This could therefore explain the difference in performance. On the other hand, the mean for low performing schools (3.52, SD=1.123) was not different from that of high performing schools (3.63, SD=1.310) for pay package. This could be due to the fact that many teachers in both the low and high performing schools are TSC employees hence are on the same salary scales.

Independent-samples t-tests were calculated comparing the mean score on motivation and salaries of schools identified as high performing schools and schools identified as low performing schools. The results are presented in table 4.47.

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TABLE 4.47 Independent Samples Test Of Motivation And Salary

The table shows the independent samples test for the means for motivation and salary.

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Cause Motivation	Equal variances assumed	.001	.971	-3.306	40	.002	-1.228	.372	-1.979	-.477
Cause Salary	Equal variances assumed	.512	.479	.264	37	.793	.103	.391	-.690	.896

No significant difference was found ($t_{(37)}$ = .264, p>0.05) in the means of salaries between the high performing schools and the low performing schools. The mean for the low performing schools (M=3.52., SD=1.123) was not significantly different from the mean of the high performing schools (M=3.363, SD=1.310). A significant difference was found ($t_{(40)}$ =.-3.306, p<0.01) in the means of motivation between the high

performing schools and the low performing schools. The mean for the low performing schools (M=3.64, SD=1.221) was significantly different from the mean of the high performing schools (M=2.41, SD=1.121).

This implies that there are differences in the motivational levels between the high performing schools and the low performing schools.

This concurs with the sentiments of Orora (1997), that, signs of high motivation include high performance, consistent achievement of results, energy, enthusiasm and determination to succeed.

4.6.2 Teacher's Competence

Teacher competence was first examined from a perspective of the teacher qualification. There was no significant correlation($r=-1.43$, $p>0.05$) between performance in KCSE science and the highest education level attained by the teacher.

Teacher competence was thus defined from a summated score of a scale in the students' questionnaire. First the scale was tested for internal consistency using Cronbach's alpha .The results indicated that the scale was reliable as it had a Cronbach's alpha value of .860 with 14 items on the scale and could be used for analysis.

An independent sample t-test was carried out to compare the means of performance in KCSE sciences based on students responses on teacher competence and the results are presented in Table 4.48.

Table 4.48 Iindependent Samples T -Test for Teacher Competence.

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	.002	.963	.831	268	.407	.06696	.08057	-.09167	.22559
Equal variances not assumed			.832	265.206	.406	.06696	.08049	-.09153	.22545

Analysis of independent sample t-tests revealed that there were no significant differences ($t_{(268)} = .831$, $p > 0.05$) in mean of the scale for the low performing schools (M=4.02, SD=.655) and the high performing schools (M=3.949, SD=.666).This implies that there were no major differences in the competence of teachers in the two categories of schools, basing on this students' response scale. The mean scores in the individual items in the teacher competence scale for all the schools is indicated in Table 4.49 below.

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Table 4.49 Frequency Table For Teacher Competence

Response		SD	D	N	A	SA	Total	Mean	SD
Show respect for all students	Frequency	22	24	17	86	119	268	3.96	1.268
	Valid Percent	8.2	9.0	6.3	32.1	44.4	100.0		
Are open and receptive to ideas	Frequency	9	18	21	119	98	265	4.05	1.014
	Valid Percent	3.4	6.8	7.9	44.9	37.0	100.0		
Show sensitivity to individual differences	Frequency	23	28	38	86	81	256	3.68	1.271
	Valid Percent	9.0	10.9	14.8	33.6	31.6	100.0		
Are punctual for classes in sciences	Frequency	14	28	27	78	117	264	3.97	1.205
	Valid Percent	5.3	10.6	10.2	29.5	44.3	100.0		
Show expertise in the subject matter	Frequency	12	21	8	109	83	263	3.87	1.086
	Valid Percent	4.6	8.0	14.4	41.4	31.6	100.0		
Are current with developments in field	Frequency	16	25	61	89	55	246	3.58	1.136
	Valid Percent	6.5	10.2	24.8	36.2	22.4	100.0		
Integrate theory with real-world	Frequency	14	17	37	86	50	204	3.69	1.135
	Valid Percent	6.9	8.3	18.1	42.2	24.5	100.0		
Communicate clearly	Frequency	6	12	11	129	108	266	4.21	.889
	Valid Percent	2.3	4.5	4.1	48.5	40.6	100.0		
Communicate constructively	Frequency	7	10	37	118	91	263	4.05	.938
	Valid Percent	2.7	3.8	14.1	44.9	34.6	100.0		
Communicate candidly and constructively	Frequency	6	31	30	93	96	256	3.95	1.090
	Valid Percent	2.3	12.1	11.7	36.3	37.5	100.0		
Have advanced my knowledge of the subject	Frequency	3	11	26	104	118	262	4.23	.877
	Valid Percent	1.1	4.2	9.9	39.7	45.0	100.0		
Show enthusiasm toward the subject	Frequency	3	15	34	116	91	259	4.07	.904
	Valid Percent	1.2	5.8	13.1	44.8	35.1	100.0		
Use helpful examples and references	Frequency	12	7	10	100	132	261	4.28	996
	Valid Percent	4.6	2.7	3.8	38.3	50.6	100.0		
Encourage student interaction	Frequency	14	12	13	94	128	261	4.19	1.085
	Valid Percent	5.4	4.6	5.0	36.0	49.0	100.0		

The table shows that generally, the column for '(A) and 'strongly agree' (SA) when combined had higher values compared to the columns for 'disagree' (D) and '

strongly disagree' SD). Therefore majority of the students considered their teachers competent, according to this scale.

The mean scores for the high and low performing schools were obtained and are as shown in table 4.50 below:

Table 4.50 Mean Scores For Low And High Performing Schools For Items In The Teacher Competence Scale

	High or Low	N	Mean	Std. Deviation	Std. Error Mean
Show respect for all students	Low	127	4.05	1.227	.109
	High	141	3.87	1.303	.110
Are open and receptive to ideas	Low	124	4.06	1.010	.091
	High	141	4.04	1.020	.086
Show sensitivity to individual differences	Low	119	3.82	1.219	.112
	High	137	3..55	1.306	.112
Are punctual for classes in sciences	Low	122	4.06	1.123	.102
	High	142	3.89	1.270	.107
Show expertise in the subject matter	Low	121	3.92	1.013	.092
	High	142	3.84	1.146	.096
Are current with developments in field	Low	116	3.41	1.187	.110
	High	130	3.73	1.070	.094
Integrate theory with real-world	Low	90	3.70	1.203	.127
	High	114	3.68	1.083	.101
Communicate clearly	Low	125	4.17	.973	.087
	High	141	4.24	.810	.068
Communicate constructively	Low	123	4.23	.787	.071
	High	140	3.89	1.030	.087
Communicate candidly and constructively	Low	119	4.03	1.065	.098
	High	137	3.87	1.110	.095
Have advanced my knowledge of the subject	Low	123	4.23	.876	.079
	High	139	4.24	.881	.075
Show enthusiasm toward the subject	Low	122	4.11	.855	.077
	High	137	4.03	.947	.081
Use helpful examples and references	Low	123	4.24	1.089	.098
	High	138	4.30	.909	.077
Encourage student interaction	Low	123	4.23	1.172	.106
	High	138	4.15	1.003	.085

The table shows that the means for low performing schools were slightly higher than those for high performing schools for all the items except for the items: 'are current with developments in the field', 'communicate clearly', and 'use helpful examples and references' Students perceived the teachers in low performing schools (M=3.41, SD=1.187) to be less current than teachers in the high performing schools (M=3.73, SD=1.070). This could be due to lack of exposure to technological developments such as internet and lack of current reference books and other teaching /learning materials in the low performing schools.

Similar differences were found relating to the item of communicating clearly where the mean for the low performing schools (M=4.17, SD=0.973) was lower than for the high performing schools (M=4.24, SD=0 .810). The difference can be explained in terms of entry behaviour of the learners. As shown in section 4.6.1, learners in low performing schools are generally admitted with low cut-off points than those in high performing schools. Thus the former are more likely to have communication problems than the latter. The mean for 'use helpful examples and references' was higher in the high performing schools(4.30 , SD=0.909) than for the low performing schools(4.24,SD=1.089).This could be due to availability more resources in the higher performing schools than in the low performing schools, hence the difference in performance.

An independent sample t-test of the differences in the students' responses of the specific items on the teacher competence scale and the performance in KCSE is presented in table 4. 51 below.

Table 4. 51 independent samples t-test of teacher competence

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Upper	Lower
Show respect for all students	Equal variances assumed	1.524	.218	1.128	266	.260	.175	.155	-.130	.480
Are open and receptive to ideas	Equal variances assumed	.018	.893	.176	263	.861	.022	.125	-.224	.268
Show sensitivity to individual differences	Equal variances assumed	2.565	.111	1.694	254	.091	.269	.159	-.044	.581
Are punctual for classes in sciences	Equal variances not assumed	4.729	.031	1.107	261.774	.269	.163	.147	-.127	.453
Show expertise in the subject matter	Equal variances assumed	2.593	.109	.590	261	.556	.079	.134	-.186	.344
Are current with developments in field	**Equal variances assumed**	**2.903**	**.090**	**-2.263**	**244**	**.024**	**-.326**	**.144**	**-.609**	**-.042**
Integrate theory with real-world	Equal variances assumed	1.635	.203	.098	202	.922	.016	.160	-.301	.332
Communicate clearly	Equal variances assumed	.758	.385	-.669	264	.504	-.073	.109	-.288	.142
Communicate constructively	**Equal variances assumed**	**2.414**	**.121**	**2.931**	**261**	**.004**	**.335**	**.114**	**.110**	**.560**
Communicate candidly and constructively	Equal variances assumed	.299	.585	1.209	254	.228	.165	.137	-.104	.434
Have advanced my knowledge of the subject	Equal variances assumed	.130	.719	-.090	260	.929	-.010	.109	-.224	.204
Show enthusiasm toward the subject	Equal variances assumed	1.210	.272	.760	257	.448	.086	.113	-.136	.307
Use helpful examples and references	Equal variances assumed	2.212	.138	-.488	259	.626	-.060	.124	-.304	.183
Encourage student interaction	Equal variances assumed	1.632	.203	.560	259	.576	.075	.135	-.190	.341

The data suggest that there were no significant differences in most of the items measured except for being current (t (244) = -2.263, $p<0.05$) and communicating constructively (t (261) = -2.931, $p<0.01$). Therefore teacher, competence as per the students' opinion was more or less similar in the low and the high performing schools thus may not be a cause of differences in performance in sciences.

4.6.3 Methods of Teaching

Teachers were asked to state frequency of use of the various teaching methods. The data for the low and high performing schools is presented in Table 4. 52.

Table 4. 52 Group Statistics on Means of Methods of Teaching Used

	High or Low	N	Mean	Std. Deviation	Std. Error Mean
LECTURE	Low	27	2.96	1.629	.313
	High	18	3.39	1.461	.344
DISCUSSION	Low	27	4.11	1.121	.216
	High	18	3.28	1.274	.300
QUESTIONING	Low	28	4.79	.787	.149
	High	16	4.25	1.342	.335
LABWORK	Low	28	3.54	.793	.150
	igh	18	3.61	1.092	257
PROJECT	Low	27	2.52	1.014	.195
	High	18	2.56	.922	.217

The table shows that the mean for low performance schools was lower (M=2.96, SD 1.629) than for the high performing schools (M=3.39 ,SD =1.461),implying that teachers in high performing schools use the lecture method more than those in low performing schools. Discussion was used more (M=4.11, M=1.121) in the low performing schools than in the high performing schools (M=3..28 SD =1.274),probably as a way of enhancing understanding and retention of what is learnt. The same explanation can be advanced for questioning, which was higher in low performing schools (M=4.79, SD =.787) compared to high performing schools (M=4.25 , SD =1.342). Lab work was lower in the low performing schools (M=3.53 SD =.793) than in the high performing schools (3.61, SD =1.092), perhaps due to inadequate resources in the former. Project work was also higher in the high performing schools (M= 2.56, SD=.922) than in the lower performing schools (M = 2.52, SD 1.014),probably due to the learners' greater inner drive and ability to work without supervision in the high performing schools.

An independent Samples t-test produced data as presented in table 4. 53

Table 4.53 Independent Samples T-Test of Methods of Teaching

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Lecture	Equal variances assumed	.794	.378	-.895	43	.376	-.426	.476	-1.386	.534
Discussion	Equal variances assumed	2.803	.101	2.313	43	.026	833	.360	.107	1.560
Questioning	Equal variances not assumed	11.89	.001	1.460	21.02	.159	.536	.367	-.227	1.299
Laboratory Work	Equal variances assumed	1.027	.316	-.271	44	.787	-.075	.278	-.636	485
Project Work	Equal variances assumed	.342	.562	-.124	43	.902	-.037	.298	-.638	.564

The data suggests that there were significant differences in the use of discussion as a method of teaching ($t_{(43)} = -2.313$, $p<0.05$) between the low performing schools and the high performing schools. There were no other differences noted from the teachers' data. The teachers responses suggested that there was more discussion in the low performing schools (M=4.11, SD=1.121) than in the high performing schools (M=3.28, SD=1.274).

Based on the fact that the high performing schools were more endowed with facilities it was expected that there should be significant differences in the use of laboratory work as a teaching method.

However the difference found was very small (M=3.54, SD=.793 and M=3.61, SD=1.O92) for low and high performing schools respectively. This implies that either the high performing schools do not fully utilise their resources or, the low performing schools, though not endowed, improvise and carry out many practical. On the issue of discussion as a method of teaching, bivariate correlations showed the existence of a strong correlation($r=-.319$, $p<0.05$) between KCSE performance in the sciences and discussion method of teaching. This tallies with the findings of Conboy and Fonseca (2006),that the most important factor influencing performance is the teacher, and by extension, the teaching method. The other methods had insignificant correlations.

4.6.4 Attitude of Teacher to Science

The teachers' attitude to science subjects was investigated using a semantic differential scale (shown in appendix iv, item 18).This yielded data as shown in table below:

Table 4.54 Attitude scale for teachers

N	Valid	29
	Missing	20
Mean		2.0345
St. Deviation		1.14900
Range		4.00

The table shows that the data had a mean of 2.034,SD=1.149.

Examination of the frequency distribution produced data as shown in table 4.55 below.

Table 4.55: Frequency distribution for attitude scale for teachers: Scale 1 extremely good attitude and 5 extremely bad attitude

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	10	20.4	34.5	34.5
	2.00	14	28.6	48.3	82.8
	3.00	1	2.0	3.4	86.2
	4.00	2	4.1	6.9	93.1
	5.00	2	4.1	6.9	100.0
	Total	29	59.2	100.0	
Missing	System	20	40.8		
Total		49	100.0		

The table shows that most of the teachers 24 (82.8%) had a positive attitude towards science. A correlation was done between the teachers' attitude and the results are as shown in table 4.56 below:

Table 4.56: Correlation of KCSE mean and Teacher's Attitude to Science

		KCSE MEAN	Attitude scale for teachers
KCSE MEAN	Pearson Correlation Sig (2-tailed)	1	-054 .782
	N	49	29
Attitude scale for teachers	Pearson Correlation Sig (2-tailed)	-054 .782	1
	N	29	29

The table shows that there was no significant correlation (r=-0.054, p=.782) between teachers' attitude towards science and performance of the school in KCSE sciences. This contradicts the findings of Mayeske (1970) and, Fonceca and Conboy (1999) who said that a teachers' positive attitude encourages and improves performance.

4.7 STUDENT FACTORS AND PERFORMANCE IN SCIENCES

4.7.1 Entry Behaviour

The teachers were asked to respond to an item "Our school selects students with very low marks at KCPE". Their responses are shown in table 4.54 below:

Table 4.57 Our school selects students with very low marks at KCPE

		Frequency	Valid Percent
Valid	Strongly Disagree	5	11.9
	Disagree	7	16.7
	Undecided	2	4.8
	Agree	14	33.3
	Strongly Agree	14	33.3
	Total	42	100.0
Missing System		7	
Total		**49**	

There was indeed mixed reaction to this item between the schools, with 12(28.6%) disagreeing, 2 (4.8%) undecided, while 28 (66.6%) agreed with the statement. This implies that according to the teachers, more than half of their learners join form one with low KCPE marks.

This could be one of the causes of low performance. The means for the low and high performing schools were obtained and are shown in table4.58 below.

Table 4.58 Group Statistics on Means of Entry Behavior

	High or Low	N	Mean	Std. Deviation	Std. Error Mean
Our school selects students with very low marks at KCPE	Low	25	4.28	.792	.158
	High	17	2.59	1.543	.374

The table shows that the mean for the low performing schools (M=4.28, SD=.792) was significantly different from the mean of the high performing schools (M=2.59, SD=1.543).This means that the 28(66.6%) teachers (in table 4.55) who said their schools enrol learners with low KCPE marks were mainly from the low performing schools This can therefore explain the difference in performance in the two categories of schools. This could imply that they have low ability or were from disadvantaged primary schools . Thus in the absence of appropriate interventions, their low ability or poor foundation is one of the reasons why they score low marks in KCSE science subjects.

An independent sample t-test was carried out to compare the means of performance in KCSE sciences based on teachers responses to the item on low KCPE marks and the results are presented in Table 4.59.

Table 4. 59 Independent Samples Test on Type of Learner

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Cause_lowKCPE marks	Equal variances assumed	17.055	.000	4.668	40	.000	1.692	.362	.959	2.424
	Equal variances not assumed			4.162	21.771	.000	1.692	.406	848	2.535

A significant difference was found ($t_{(21.77)} = 4.162$, $p<0.01$) in the means of the low performing schools and the high performing schools, in relation to performance in KCSE science. This implies that teachers in low performing schools perceived their students as having joined the school with low KCPE marks. This therefore partially

explains why such schools perform poorly in sciences. Data obtained from the head teachers, on the cut off mark for admission into form one is presented in table 4.60.

Table 4.60: Group Statistics: Cut-Off Marks For Admission into For One: Head Teachers Response

	Low or High	N	Mean	Std. Deviation	Std. Error Mean
Cut off mark KCPE	Low	6	226.67	38.816	15.846
	High	4	300.25	57.332	28.666

The mean cut off mark for low performing schools (M=226.67, SD=38.8) was significantly lower than for the high performing schools (M=300.25, SD=57.33).This confirms findings from teacher responses in section 4.6.1 above.

Independent samples test for the means was done and the results are as shown in table 4.61 below:

Table 4. 61 Independent Samples Test of cut off marks at KCPE

Cut off mark KCPE	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	.314	.591	-2.445	8	.040	-73.583	30.099	-142.991	-4.175
Equal variances not assumed			-2.247	4.842	.076	-73.583	32.754	-158.612	11.445

There was a significant difference ($t_{(8)}$ =-2.445, $p<0.05$) in the entry cut off marks at form one.

This implies that the difference in cut off points for form one admissions between the low performing schools and high performing schools is big enough to be considered as one of the possible causes off differences in performance in sciences.

4.7.2 Discipline

A Likert scale item required teachers to state their views on the statement "*there is poor discipline among students and it affects performance in the sciences*". The results are presented in table 4.62 below.

Table 4.62 Effect Of Poor Discipline On Performance In Sciences

Cause Discipline

		Frequency	Valid Percent
Valid	Strongly Disagree	4	10.0
	Disagree	9	22.5
	Undecided	4	10.0
	Agree	14	35.0
	Strongly Agree	9	22.5
	Total	**40**	**100.0**
Missing System		9	
Total		49	
Mean		3.38	
S.D.		1.334	

The results indicated a mean of 3.38 (SD=1.334). There were mixed views on the influence of discipline on performance with 13(42.5%) disagreeing while another 23(57.5%) agreeing with the statement.

Correlation of this item with KCSE performance in the sciences yielded no significant correlation (r=-.294, p>0.05). The means for the high performing schools and those identified as low performing are presented in table 4.63 below.

Table 4.63 There Is Poor Discipline among Students and It Affects Performance In The Sciences

High or Low	N	Mean	Std. Deviation	Std. Error Mean
Low	23	3.70	1.185	.247
High	17	2.94	1.435	.348

The mean for the low performing schools (M=3.70, SD=1.185) was different from the mean of the high performing schools (M=2.94, SD=1.435).This implies that there was a higher degree of indiscipline in the low performing schools than in the high performing schools and this could possibly be a cause of the difference in performance .

Correlations of this item on discipline and KCSE performance in sciences did not yield any significant correlation (r=-.294, p>.354). This implies that for this particular sample, discipline has no effect on performance in KCSE science subjects.

An independent-samples t-test were calculated comparing the mean score on influence of poor discipline of schools identified as high performing schools and schools identified as low performing schools. The results are presented in table 4.64.

Table 4.64 Independent Samples Test of teachers responses on Discipline

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	1.864	.180	1.820	38	.077	.754	.414	-.085	1.594
Equal variances not assumed			1.768	30.543	.087	.754	.427	-.116	1.625

No significant difference was found ($t_{(38)} = 1.820$, $p > 0.05$) in the means of poor discipline between the high performing schools and the low performing schools.

Data obtained from head teachers also yielded no significant difference ($t_{(10)} = 1.074$, $p > 0.05$) in the means of poor discipline between the high performing schools and the low performing schools.

Table 4.65:Headteachers'Respones On Discipline

Indiscipline : from Head teacher respondents	**N**	**Mean**	**S.D.**
Low	8	1.9618	0.52850
High	4	1.6389	0.38889

The mean for the low performing schools (M=1.96, SD=.5285) was not significantly different from the mean of the high performing schools (M=1.64, SD=.3889).

The finding contradict what Griffin (1994) said, that indiscipline leads to poor results.

4.7.3 Students' Attitude towards Sciences

Data was obtained from the students responses on a semantic differential scale on their attitude towards sciences (Found in appendix lV, item 18). The scale had good internal consistency as the computed value for Cronbach's alpha of .785 indicated that the scale was reliable.

Overall, the attitude scale had a mean of 1.684 (SD= .684). An independent sample t-test comparing the mean of the attitude scale for the high performing schools and the low performing schools produced data as presented in table 4.66

Table 4.66 Independent Samples Test of Attitude of students towards sciences.

Attitude Scale	Levene's Test for Equality of Variances							
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
							Lower	Upper
Equal variances assumed	2.298	.131	-2.012	230	.045	-.18011	-.35645	-.00376
Equal variances not assumed			-2.029	229.398	.044	-.18011	-.35503	-.00519

The table shows that there were significant differences in attitude of students towards the teaching of sciences ($t_{(230)}$=-2.012, $p<0.05$) as the means for the low performing schools(M=1.587,SD=.640) was significantly lower than the mean for the high performing schools(M=1.767, SD=.711).

This is possibly one of the factors that cause difference in performance between the two categories of schools. The scale had a Cronbach's alpha reliability of .586 based on four items. The item Beneficial –Harmful scored poorly as it had low item-total correlation and was deleted. Similar data on attitude of teachers towards the teaching of sciences yielded data with (M= 2.034, SD=1.149). Examination of the frequency distribution indicated that most teachers 24(82.8 %) had a positive attitude towards sciences. However there was no significant correlation (r=-0.054, p=.782) between teachers attitude towards science and performance of the school in KCSE sciences. This contradicts the findings of Mayeske (1970) and Conboy and Fonseca (1999) who said that a teachers positive attitude encourages students and improves performance.

Bivariate correlations between the performance in KCSE sciences and the research variables yielded data as presented in Table 4.67.

Table 4. 67 Correlations of teachers' data on performance of KCSE science and research variables

		1	2	3	4	5	6	7	8	9	10	11	12	13
1. KCSEMEAN	Pearson Correlation	1	.566**	.422**	.478**	.462**	.436**	-.319*	-.356*	-.487**	-.777**	-.390*	.384*	-.777**
	Sig. 2-tailed	.	.000	.004	.002	.004	.004	.033	.021	.001	.000	.013	.013	.000
2.Teaching Experience	Pearson Correlation	.566**	1	.948**	.249	.100	.033	-.299*	-.130	-.174	-.430**	-.122	.242	-.430**
	Sig. 2-tailed	.000	.	.000	.117	.551	.836	.046	.413	.270	.005	.453	.127	.005
3.Age of Respondent in years by group	Pearson Correlation	.422**	.948**	1	.185	.049	-.019	-.303*	-.084	-.263	-.281	-.185	.087	-.281
	Sig. 2-tailed	.004	.000	.	.259	.778	.910	.048	.606	.102	.079	.266	.598	.079
4.Laboratories available	Pearson Correlation	.478**	.249	.185	1	.832**	.614**	-.212	-.102	-.062	-.268	-.030	.281	-.268
	Sig. 2-tailed	.002	.117	.259	.	.000	.000	.189	.548	.709	.104	.864	.093	.104
5.Lab chemicals available	Pearson Correlation	.462**	.100	.049	.832**	1	.792**	-.101	-.258	-.208	-.280	-.114	.480**	-.280
	Sig. 2-tailed	.004	.551	.778	.000	.	.000	.551	.135	.231	.103	.529	.004	.103
6.Lab Equipment available	Pearson Correlation	.436**	.033	-.019	.614**	.792**	1	.003	-.300	-.124	-.311	-.245	.374*	-.311
	Sig. 2-tailed	.004	.836	.910	.000	.000	.	.987	.071	.458	.058	.150	.022	.058
7.Method_Discussion	Pearson Correlation	-.319*	-.299*	-.303*	-.212	-.101	.003	1	.091	.037	.233	-.111	-.142	.233
	Sig. 2-tailed	.033	.046	.048	.189	.551	.987	.	.571	.820	.143	.503	.382	.143
8.Leadership Style	Pearson Correlation	-.356*	-.130	-.084	-.102	-.258	-.300	.091	1	.251	.354*	.154	-.308	.354*
	Sig. 2-tailed	.021	.413	.606	.548	.135	.071	.571	.	.119	.025	.354	.056	.025
9.motivation	Pearson Correlation	-.487**	-.174	-.263	-.062	-.208	-.124	.037	.251	1	.372*	.264	-.293	.372*
	Sig. 2-tailed	.001	.270	.102	.709	.231	.458	.820	.119	.	.015	.099	.063	.015
10.Low KCPE	Pearson Correlation	-.777**	-.430**	-.281	-.268	-.280	311	.233	.354*	.372*	1	.364*	-.342*	1.000**
	Sig. 2-tailed	.000	.005	.079	.104	.103	.058	.143	.025	.015	.	.021	.029	.
11.Science hard	Pearson Correlation	-.390*	-.122	-.185	-.030	-.114	-.245	-.111	.154	.264	.364*	1	-.206	.364*
	Sig. 2-tailed	.013	.453	.266	.864	.529	.150	.503	.354	.099	.021	.	.203	.021
12.Syll_students aware	Pearson Correlation	.384*	.242	.087	.281	.480**	.374*	-.142	-.308	-.293	-.342*	-.206	1	-.342*
	Sig. 2-tailed	.013	.127	.598	.093	.004	.022	.382	.056	.063	.029	.203	.	.029
13.LOWMARKS	Pearson Correlation	-.777**	-.430**	-.281	-.268	-.280	-.311	.233	.354*	.372*	1.000**	.364*	-.342*	1
	Sig. 2-tailed	.000	.005	.079	.104	.103	.058	.143	.025	.015	.	.021	.029	.

** Correlation is significant at the 0.01 level 2-tailed.

Correlation is significant at the 0.05 level 2-tailed.

There were significant correlations between performance in KCSE sciences and the Teaching Experience, Age of Respondent, Laboratories available, Lab chemicals, available Lab Equipment, method discussion, Leadership Style, motivation, Low KCPE, Science hard, students aware of Syllabus. The most significant correlation was between the KCPE marks and performance in KCSE sciences ($r=.777$, $p<0.01$) implying that students who joined school with low KCPE were more likely to score low marks at KCSE in sciences.

Students were asked to state what things they really like about science subjects. The findings from the qualitative data were coded and summarized in the table 4.68.

Table 4. 68 Students' Responses on Things They Really Like About Science Subjects

Response	**Frequency**	**%**
Enjoy doing Experiments / practical	62	25.4
The teacher is clear, communicates well, is available, punctual and rewards us.	44	18.0
Discussion , group work	39	16.0
Beneficial ideas on health and general life	26	10.7
CATS and quizzes, calculations and asking questions	23	9.4
is interesting	18	7.4
Identification of organisms	11	4.5
It is easy/ we pass highly	11	4.5
Specific topics	6	2.5
Nothing /Sleeping	4	1.6
Total	**244**	**100.0**

The highest response suggested that students above everything enjoyed doing science practical work and experiments 62 (25.4%).

This is a critical factor in students' performance in science and is a strength that may have not been fully utilized by teachers. Second in rank of importance students44 (18%,) suggested that the teacher quality in terms of being clear, communicating well, being available, punctual and rewarding students played a critical role in influencing their enjoyment of science subject .

An interesting comment was from 4(1.6%) of the valid responses who suggested that they enjoyed sleeping or doing nothing in science lessons. This response represents a silent group who have no interest at all in the sciences and may not be expected to do well in science examinations.

Students were further asked to state what they did not like about the sciences. Their responses are presented in table 4.69

Table 4. 69 What students did not like about the sciences.

Response	**Frequency**	**%**
Dangerous experiments / bad smells / disgusting animals	11	5.189
Noise in class	11	5.189
Overcrowding	8	3.774
Inability to understand the teacher	**61**	**28.774**
Dull boring teacher	**18**	**8.491**
Doing calculations	15	7.075
Teacher is slow / shortens lessons/ comes late/ omits difficult concepts	**12**	**5.660**
Not doing experiments / theory alone	18	8.491
Scarcity of apparatus	7	3.302
Being caned for not finishing work	9	4.245
Difficult terminologies in biology	8	3.774
Too much homework	7	3.302
Teacher comes late and cancels quiz	**5**	**2.358**
Teacher gets angry over small issues	**7**	**3.302**
Teacher favours bright students	**8**	**3.774**
Lack of time	7	3.302
TOTAL	**212**	**100.000**

Out of the 212 responses 104 (52.4 %) were on issues to do with the science teacher characteristics and qualities. These were: inability to communicate clearly and thus students could not understand the teacher 61 (28.77%), teachers were dull and boring16 (8.49%) and, teachers are slow and shortened lessons12 (5.66%) . It was thus evident that the teacher played a critical role in the students' enjoyment of science subjects. It was also evident that the practice of caning of students was still in existence in schools 9 (4.2%) and was an issue the students associated with their dislike of sciences.

The issue of practical also came out as a strong factor. This can be seen by putting together those who are disgusted by practical 11 (5.189%) lack of practical 18 (8.491%) and scarcity of apparatus 7 (3.302%). This totals to 36(16.982%) a figure that is second only to teacher characteristics .This impacts negatively on the use of practical which is a core method of teaching science hence the poor performance.

The students were further asked to state whether they considered their performance good or poor and state the causes of their poor or good performance. Responses to this question were summarized as shown in table 4.70.

Table 4.70 Responses To The Question 'Is Your Performance In Science Good or Poor?'

	Good	**Poor**	**Total**
High performing schools	94	13	**107**
Low performing schools	40	60	**100**
Total	**134**	**73**	**207**

The table shows that out of the 207students who answered the question, 134(65%) said their performance was good while 73(35%) said their performance was poor.

The 134 good performers comprised of 94(70%) from the high performing schools and 40(30%) from the poor performing schools.

Among the 73 who said they performed poorly, 13(17%) were from the high performing schools while 60(83%) were from the low performing schools. It can therefore be seen that even within the high performing schools, some students do not do well in the science subjects. This also gives evidence that at individual level, some students in the low performing schools do well. Students who considered their performance to be good in sciences gave the reasons presented in Table 4.71 below.

Table 4. 71 Students responses on reasons for good performance in sciences

Reasons for Good Performance in Sciences	**Frequency**	**%**
Respect teacher and work hard	62	46.3
Positive attitude / Interest / useful	29	21.6
Devotes more time to sciences	11	8.21
Teachers skills, conduct, encouragement And guidance.	10	7.46
Own potential in science	6	4.48
Doing practical	5	3.73
Use of discussion groups	5	3.73
Asking and answering questions in class	4	2.99
Attend all lessons	2	1.49
Total	**134**	**100**

The most important reason for the students perceived good performance in sciences was that they respected teachers and worked hard 62 (46.3%).

The second most important reason was that they had a positive attitude and found the subject interesting and useful 29 (21.6%). Students who considered their performance to be poor in sciences gave the reasons presented in Table 4.72 below.

Table 4.72 Students Response on Reasons for Poor Performance in Sciences

Reasons for Poor Performance in Sciences	**Frequency**	**%**
Lack of research and reading on covered topics	13	17.8
Inadequate exercises and revision	11	15.1
Lack of textbooks leading to poor understanding of topics	11	15.1
I don't understand teacher explanations	8	10.96
Very old lab, old equipment , lack of practicals	8	10.96
Lack of guidance from the teacher/ teacher Assumes learners	5	6.85
Fail to hand in homework	5	6.85
Lack enough time to revise	2	2.74
Absenteeism due to school fees	2	2.74
Lack of notes	2	2.74
Carelessness in reading questions	1	1.37
Teacher uses class texts only	1	1.37
Strict marking discourages	1	1.37
Confusion of facts during exams	1	1.37
Failure to complete syllabus	1	1.37
I don't like the teacher	1	1.37
Total	**73**	100

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Students attributed their poor performance in sciences to mainly to lack of research and reading on covered topics13 (17.8%).

The second most importance reason was attributed to inadequate exercises and revision 11 (15.1%) and thirdly due to lack of textbooks leading to poor understanding of topics 11 (15.1%). Other reasons cited were lack of practical work 8 (10.9%). Other interesting reasons given were strict marking by teachers which discourages 1 (1.37%) and that they did not like the teacher 1 (1.37%). Students were asked to suggest how the science class can be improved so as to improve performance. The data they gave is summarized in table 4.73 below.

Table 4.73 Students Suggestion for Improvement of Science

Response on Suggestion for Improvement of Science	**Frequency**	**%**
Provide a laboratory for each subject and equipments for practicals	66	19.4
Provide more textbooks and revision books per student	59	17.3
Form discussion groups	46	13.5
More exercises, quizzes and exams after every topic	44	12.9
Improve quality of teachers, more serious, offer more guidance, free with students and not harsh	40	11.7
Allocate more time for study and research with	16	4.7
Participate in class, don't sleep in class	14	4.1
More field work / trips	14	4.1
Teachers and learners to be punctual	13	3.8
Attendance of symposiums and science congress	10	
Teachers not to favour bright learners, attend to weak	8	2.3
Teachers to give proper / more notes	4	1.2
Teachers to vary mode of teaching and use teaching aids like the internet	4	1.2
Employ more teachers	3	0.9
	341	100.0

The highest percentage of the valid responses 66 (19.3%) from students suggested that practical were considered a very important factor for improvement in sciences. This finding seemed to agree with the quantitative data obtained. The second most important factor was the provision of revision books per student 59 (17.3%). Other important suggestions made were on use discussion groups 46 (13.5%) and teacher to give

learners more exercises, quizzes and exams after every topic 44 (12.9%). The teacher did not escape mention here with 14 (11.7%) of the valid responses suggesting that teachers should be more serious, offer more guidance, be free with students and not harsh.

4.8 SCHOOL CHARACTERISTICS

Schools were categorized as public or private schools, girls/ boys or co-educational and the thirdly, day or boarding classification as shown below:

Table 4.74 Sample characteristics

	School Type	Number
	Private	7
	Public	5
	Girls	1
	Boys	1
	Mixed	10
	Day	10
	Boarding	2

The table shows that the sample consisted of seven (7) private and five (5) public schools.Among the twelve, there was one (1) girl, one (1) boys and ten (10) mixed

schools .Ten (10) of the schools were day schools while two (2) were boarding schools.

4.8.1 Public /private schools categorization

Computation of KCSE performance in sciences and school categorization as public or private is shown in table 4.75.

Table 4.75 Group Statistics: KCSE Mean For Private And Public Schools

	Private or Public	N	Mean	Std. Deviation	Std. Error Mean
KCSE MEAN	Private	7	3.5371	1.38679	.52416
	Public	5	5.0040	2.74593	1.22802

The mean for public schools was 5.004 (SD=2.7459) while for the private schools was (M=3.5371, SD=1.387) implying that performance in sciences was much better in the public schools than in the private schools.

Independent samples t -test for the means of private and public schools was done and the data is given in table 4.76 below:

Table 4. 76 Independent samples t-test of public and private schools

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Upper	Lower
Equal variances assumed	7.711	.020	-1.227	10	.248	-1.46686	1.19570	-4.13105	1.19733
Equal variances not assumed			-1.099	5.469	.318	-1.46686	1.33520	-4.81240	1.87868

The data indicated that there was no significant difference between public and private schools in terms of their performance in KCSE sciences ($t_{(5.469)} = -1.099$, $p > 0.05$) This could be attributed to the fact that the high performing schools are spread out among the public and private schools.

4.8.2 Day or Boarding Schools

Independent sample t-test could not be carried out as there were only two schools in the boarding category that responded. The means of performance are presented in table4.77.

TABLE 4.77 Group Statistics

	Day or Boarding	N	Mean	Std. Deviation	Std. Error Mean
KCSE MEAN	Day	10	3.7245	1.55784	.46971
	Boarding	2	8.665	.	.

The mean for the day schools (M=3.72, SD=1.558) was significantly different from the mean of the boarding schools (M=8.81, SD=.000), implying that boarding schools perform better than day schools in sciences. This could be attributed to the fact that the boarding schools have more time for studies as they extend to evenings and weekends. In addition, one of the boarding schools was a national school that had adequate resources and admits learners with high KCPE marks while the other one was a high cost private school which, in addition to being fully equipped, had very high discipline as it was a catholic seminary school.

4.8.3 Mixed/Single sex schools

Table 4.69 A Comparison of the means of the mixed and single sex schools was made and the data is shown in table 4.78 below.

Table 4.78: The average means for KCSE science subjects for the sampled boys', girls' and mixed schools from 2001 to 2005.

	Girls or Boys	N	Mean	Std. Deviation	Std. Error Mean
KCSE MEAN	Girls/Boys only	2	8.665	0.145	.
	Mixed	10	3.7245	1.55784	.46971

The table shows that means for boys only or girls only schools are very high compared to the mean for mixed schools, implying that same sex schools perform better than mixed schools. The means for the same sex schools were very high possibly due to a condusive environment for learning, in the absence of distractions and pressures of teenage gender issues in mixed schools. The difference could also be due to the low number of same sex schools in the sample, which was occasioned by the fact that Eldoret Municipality has very few such schools, and aggravated by failure by some schools to return the questionnaires .In addition the same sex schools also happen to be boarding while all the mixed schools were day schools, a condition

that further favors the former in terms of more time for study. Independent samples test for the means was done and the data is given in tale 4.79 below.

Table 4.79 Independent samples test for means of same sex and Mixed schools

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Upper	Lower
Equal variances assumed	.	.	3.125	10	.011	5.08545	1.62711	1.46002	8.71088
Equal variances not assumed			.	.	.	5.08545	.	.	.

The table shows that there was a significant difference ($t_{(10)\ =3.125,}$ $p< 0.05$) between the means of single sex schools(M=8.665,SD=0.145) and the means of mixed schools(M=3.7245, SD =1.55784).

This implies that the single sex schools have a set of characteristics that differ from those of mixed schools, hence the difference in performance.

4.9 SUMMARY OF THE CHAPTER

This chapter has presented the findings of the study of the factors that influence performance in the sciences within Eldoret Municipality. Data analysis combined the use of descriptive statistics, independent sample t-tests and correlation analysis.

The study investigated differences between the low performing schools and the high performing schools with regard to the influence of physical and human resources, head teachers management, supervision, leadership style and delegation. The study also explored the quality of teaching, involvement of teachers in decision-making, teamwork and their level of motivation, discipline and their attitude to sciences. The student factors investigated were the home environment, entry behaviour discipline and their attitude towards science subjects. The school characteristics investigated were: the category in terms of public/private, same sex/mixed, and boarding/day schools. The next chapter presents a summary of the findings, recommendations and, suggestions for further study and conclusion.

CHAPTER FIVE

5.0 SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

This chapter is the culmination of the process used to analyze the survey responses of students, teachers and head teachers in 12 secondary schools of Eldoret Municipality. It presents a summary of major findings, conclusions, recommendations and suggestions for further study. The chapter begins by revisiting the research objectives and the purpose of the study as outlined in chapter one. The seven study objectives are discussed and conclusions drawn. The chapter concludes with a highlight of the major findings, suggestions for future research and recommendations for educators, policy planners and teachers involved in the demystifying science so as to improve performance.

5.2 PROBLEM AND OBJECTIVES OF THE STUDY

The purpose of the study was to explore the factors that determine the kind of results that schools get in science subject in KCSE examinations. The perennial poor performance in science subjects has been a worldwide problem and is true within Eldoret Municipality as majority of the students score below C- , a grade considered to be poor. The study was guided by the following specific objectives:-

(i) To establish the availability of human and non-human resources for teaching science subjects.

(ii) To find out the head teachers' qualifications, experience and leadership styles.

(iii) To establish the degree of supervision, delegation, teamwork and involvement of teachers in decision-making.

(iv) To find out the level of motivation and discipline among teachers and students.

(v) Establish the influence of school type and the entry behaviour of their learners.

(vi) To find out the degree of competence of teachers and the methods of teaching that they employ.

(vii) To find out the attitude of teachers and learners to science subjects.

5.3 THEMATIC SUMMARY OF FINDINGS.

This study is primarily quantitative, although some qualitative data have been included. The following are the findings that resulted from this comprehensive study. Included also are the researcher's observations about these findings.

5.3.1 Availability of human and non-human resources

The role of availability of human and physical resources in influencing the performance of schools in KCSE sciences was investigated. The availability of human resources was not a significant factor as most schools had basically the same type of teachers in terms of their educational level and teaching experience. The most important factor was the availability of laboratories. There were significant differences in the availability of science teaching resources between the low performing schools and the high performing schools. Schools with adequate resources were found to perform better than those without. Students in low performing schools were thus disadvantaged. In addition the researcher found out that most of the low performing schools were located in the low socio-economic neighbourhoods and were all day schools. Due to the low economic status of the home backgrounds of the learners it can be implied that the schools lack of learning resources is as a result of lack of funds due to poor fees payment by the learners. One head teacher of such a school reported that the economic situation of the parents has been worsened by the prevalence of HIV/AIDS such that the little money available goes to health care, so that learners can not attend school. This

affects performance in a dual way as the learners stay away from schools and in addition, the schools do not have money to buy the learning resources.

5.3.2 Administrative Factors

Majority of the head teachers were found to be fully qualified, experienced and practicing participative leadership. However a few in the low performing schools were found to employ dictatorial leadership styles as reported by the teachers. The effect of the leadership style was not as significant predictor of performance in sciences at KCSE as the correlation between leadership and performance was not very significant. There were no significant differences between the high performing schools and the low performing schools.

The study found no significant relationship between supervision, delegation, and teamwork, and the dependent variable of performance in science subjects. There were no significant differences between the high performing schools and the low performing schools in terms of these variables.

5.3.3 Teacher Factors

The study found no significant relationship between supervision, delegation, teamwork, involvement of teachers in decision-making and performance in science subjects. There were no significant differences between the high performing schools and the low performing schools in terms of these variables. The study found significant differences between the high performing schools and the low performing schools with regard to motivation and discipline. In the high performing schools, teachers were rewarded for their work and this had a causal effect of increasing their level of motivation. Issues to do with financial remuneration through salaries got mixed reaction. Some teachers observed that an increase in salary would increase performance. This however could

easily be disputed as the TSC had made such provisions where the science teachers' were given an increase in salaries but this has not resulted in an improvement in performance of sciences countrywide.

Morale was also found to affect performance among students mainly as a consequence of their negative attitude to science. Some of the factors that de-motivate learners as reported by students is discussed later.

On issues of discipline, 23 (57.5%) of the teachers said poor discipline in their schools affected performance. This finding was confined to the low cost private schools. A head teacher of one of them confided to the researcher that some of the girls are so pre-occupied with love affairs that by the time KCSE time reaches, they have to be retrieved from marriages (at times nursing babies) to sit for the exams. As expected, such candidates have neither attended school fully nor had the time to do adequate revision.

On a positive note, another head teacher reported that his school has zero tolerance for indiscipline and that any such cases led to instant expulsion. Consequently, such cases were as rare as two per year. The effect of this on performance was evident as the school was ranked second in the municipality.

Perhaps the most important factor, and one of the most difficult to influence directly, is the quality of teaching. Students readily recognize if their teachers are effective or ineffective and are quick to state the same to an outsider. This was corroborated with data from the qualitative instrument where some students stated that they did not like it when their teachers shortened lessons or simply avoided answering the hard questions from the students. The school head teachers may not be privy to the same level of

knowledge of the competence of their teaching staff. Any effort to get such information is misconstrued to be infringing on the teachers rights and freedom. This brings into focus issues on the professional development of a teacher. The National Research Council (2002) reform document emphasizes the importance of quality of teaching and quality of professional development, and talks about teacher development as a channel for influencing student learning and academic success.

The study established that learners were very sensitive to the teachers' pedagogical and content mastery. There were significant differences in what students perceived as their teachers being current ($t_{(244)} = -2.263$, $p<0.05$) and communicating constructively ($t_{(261)} = -2.931$, $p<0.01$). This implied that students perceived the teachers in low performing schools (M=3.41, SD=1.187) to be less current than teachers in the high performing schools (M=3.73, SD=1.070). This was further confirmed form the qualitative data where some students reported their ability to notice when the teacher is trying to avoid difficult concept or topics, a habit that the learners detest and makes them hate science. The quality of teachers teaching ranked very highly among the things that students liked about science. The teacher either came first, second or third in the responses to the questions.

The methods of teaching were found to affect performance as the learners who reported that their performance was good also attributed this to the fact that they do many practicals, carry out discussions regularly and participate in asking and answering questions. On the other hand, those who reported that their performance is low attributed it to lack of practical , lack of discussion the teacher dictating while teaching, not giving notes or giving notes with no explanation, and the teacher not involving learners in what he/she is teaching. The latter can be taken to imply lecturing plus the

teacher performing experiments as learners watch (teacher-centred methods). Generally practical, which should be the core of science-teaching and which majority of students enjoy were not being used adequately as a method of teaching as reported by students.

There was no significant correlation (r=-0.054, p=.782) between teachers attitude towards science and performance of the school in KCSE sciences. However, some teachers felt that the syllabus was too wide to be effectively taught within the stipulated time.

5.3.4 Student factors

The study found significant correlations between the type of school, entry behaviour of the learner and performance in KCSE science subjects.

There were significant differences between the high performing schools and the low performing schools with regard to the two variables. A head teacher of one of the low performing schools even expressed a wish that his school should not be ranked alongside the other schools as he admits learners whose KCPE marks are so low that they cannot be admitted anywhere else. Hence previous student preparation affects performance in sciences.

The parents' educational level was found to be a significant predictor of performance. In particular the mothers' highest educational level was found to be one of the key factors influencing the performance.

The study found that there were significant differences in attitude of students towards the teaching of sciences ($t_{(230)}$=-2.012, $p<0.05$) as the means for the low performing schools(M=1.587,SD=.640) was significantly lower than the mean for the high performing schools(M=1.767, SD=.711). The learners seemed to agree that science

subjects are difficult. Others said there is nothing good about science; experiments are dangerous, difficult and at times do not yield expected results. Some suggested further that calculations should be removed. Others said that they disliked drawing, terminologies were difficult and that the syllabus was long. They further said exams were difficult yet marking was too strict. Those implied that a lot needs to be done to change the negative attitude of the students.

5.3.5 School Characteristics

The study also established that boarding schools do better than day schools while same sex ones outdo the mixed ones. A point worth noting here is that girls who are generally or culturally thought to be weaker than boys in sciences were found to not only excel but also opted for physics as a favourite subject. This finding was surprising and could partly be attributed to the sampling of a national girl's school.

This also proves that with proper set ups and strategies, no science subject is too hard for any gender.

It also came out clearly that social economic factors play a role as majority of the low performing schools were day schools located in low income neighbour-hoods. Most of the low performing schools were the private schools.

5.4 RECOMMENDATIONS

Effective science education implies the creation of school and home environments for maximizing learning success, which in turn requires information as to the causes of poor performance. The findings and conclusion of this study have several potential

implications for science educators and other educational leaders regarding the teaching and learning of secondary level science.

(i) Ministry of Education officials should conduct a school audit on the availability and actual use of laboratories. This should be coupled with efforts to standardize the provision of basic science resources in schools sciences. The defunct Kenya School Equipment Scheme (or a similar organization) should be revived with the express aim of providing basic science resources. Private schools should be compelled to equip their schools adequately before they are licensed

(ii) Science educators and school leaders need to implement measures that encourage the development of teacher expectancies for high academic performance of their learners. This implies both the availability of generous support mechanisms and, at the same time, a low tolerance for failure.

(iii) There should be more and frequent in-servicing of both head teachers on ways of enhancing the teaching/learning of science. The teaching of science subjects should be totally practical oriented. To ensure this, text books should be revised such that the practical are done first then the discussion and conclusions come later. To assist the teacher with the additional workload occasioned by increased practical, the government should take the responsibility of training and hiring of laboratory technicians on a better scheme of service. This will separate them from the subordinate staff, elevate their

morale and create a better working relationship between them and the teachers.

(iv) Career guidance should be emphasised or revamped to enhance learners' awareness of the relevance of science in the job market. This will improve their attitude towards science subjects.

5.5 SUGGESTIONS FOR FUTURE RESEARCH

Based on the results of this study and the inherent limitations of the study design and sampling done, it is important that future research directions be guided by the following suggestions:-

(i) Future research needs to focus specifically on the low performing schools categories as the factors influencing performance in sciences in these schools are unique and different from the factors at play in the high performing schools.

(ii) An important modification which can be explored is a refinement of the scale for measuring performance in sciences to include the actual performance of a cohort group tracked in a longitudinal (ethnography) study. This would help generate more accurate data based on the actual performance of the learners in science rather than the implied science performance of students who are not in the sample.

(iii) In addition, there is evidence to suggest that within Kenya, performance in sciences differs between the schools in urban areas and those in rural areas. Future research should explore empirically these differences in science performance.

(iv) Further research should be done to find out the perceptions of students about their teachers' competence in an effort to establish if this contributes to the difference in performance between the low and high performing schools.

5.6 CONCLUSION

This study has explored the factors that influence performance of students in sciences. The study has established that there are significant differences between the low performing schools and the high performing schools in terms of resources, and entry behaviour of the learners.

The availability and use of laboratories, students input in reading science textbooks and home factors of mothers' educational level and students' actual involvement in practical work are critical factors. The associations encountered in this study are suggestive, but are not strong individually. They paint a picture of a multifaceted system that reflects the complexity of the problem of performance in sciences in secondary schools. The health of science tomorrow and the industrialization of our country depend on improved science preparation and performance of our students today. The responsibility of teaching and learning sciences cannot be delegated solely to teachers and schools, but requires a collective effort and a shared responsibility. In addition, we cannot expect instant results. Improved student performance in sciences will not be achieved if the conditions for schooling do not change and our strategies remain disjointed.

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Appendix 1 List of Secondary schools in Eldoret Municipality and their KCSE

SCHOOL	MEAN GRADE
Moi Girls	8.867
Mother Of Apostles	9.67
Uasin Gishu	8.121

performance in 2005

Chebisaas Boys	7.750
Mwiruti Secondary	4.352
Eldoret Magereza	3.946
Sirikwa Academy	3.531
P.G.S. Secondary	3.347
Sage Academy	3.279
Kapsaos Secondary	3.258
64 Secondary School	3.174
Eldoret Secondary	2.283

SCHOOL	SUBJECT	2005	2004	2003	2002	2001
64' SEC	BIOLOGY	2.507	3.141	2.6	2.525	3.119
64' SEC	PHYSICS	2.875	2.56	2.28125	2.343	2.333
64' SEC	CHEMISTRY	2.247	2.661	2.257731959	2.322	2.379
ELDORET HARAMBEE	BIOLOGY	5.188	6.434	7.346153846	5.152	6.191
ELDORET HARAMBEE	PHYSICS	5.343	6.973			
ELDORET HARAMBEE	CHEMISTRY	3.673	4.381	4.357142857	3.219	3.664
ELDORET MAGEREZA	BIOLOGY	2.808	3.921		3.949	3.857
ELDORET MAGEREZA	PHYSICS	3.000	3.5		2.487	2.980
ELDORET MAGEREZA	CHEMISTRY	2.590	3.333		2.487	2.980
ELDORET SEC	BIOLOGY	2.362	1.987	2.90625	1.891	
ELDORET SEC	PHYSICS	2.786	2.094	2.851851852	1.882	
ELDORET SEC	CHEMISTRY	2.000	2.143			

Source: U.G District I Ranking List for 2005 K.C.S.E

Appendix II KCSE Performance in Sciences 2001-2005

SCHOOL	SUBJECT	2005	2004	2003	2002	2001
KAPSAOS	BIOLOGY	2.857	3.093	3.47826087	3.306	3.525
KAPSAOS	PHYSICS	2.818	2.588	2.090909091	2.889	1.818
KAPSAOS	CHEMISTRY	2.246	2.413	2.166666667	2.526	2.333
MOI GIRLS'- ELDORET	BIOLOGY	9.976	9.892	9.055214724	9.142	9.279
MOI GIRLS'- ELDORET	PHYSICS	7.906	7.934	7.896	9.460	6.303
MOI GIRLS'- ELDORET	CHEMISTRY	9.447	9.263	9.45398773	8.923	8.149
MOTHER OF APOSTLES	BIOLOGY	8.639	8.136	8.8734		
MOTHER OF APOSTLES	PHYSICS	8.771	8.911	8.9114		
MOTHER OF APOSTLES	CHEMISTRY	8.154	8.154	8.1538		
MWIRUTI	BIOLOGY	3.314	3.891	3.962962963	4.640	4.000
MWIRUTI	PHYSICS	4.818	3.455	2.2	3.667	
MWIRUTI	CHEMISTRY	2.679	2.872	2.454545455	2.739	2.300
P.G.C. SEC	BIOLOGY	3.031	3.12	3.08	4.167	3.143
P.G.C. SEC	PHYSICS	2.600	3.25	2.909090909	3.200	2.875
P.G.C. SEC	CHEMISTRY	2.141	2.793	2.64	2.364	2.583
SAGE ACADEMY	BIOLOGY	2.721	3.667	2.944444444	4.167	3.143
SAGE ACADEMY	PHYSICS	3.286	n/a			
SAGE ACADEMY	CHEMISTRY	2.302	3	1.388888889	3.200	2.875
SIRIKWA	BIOLOGY	2.968	n/a	3.130434783	2.646	3.250
SIRIKWA	PHYSICS	4.000	3.6	3.076923077	3.421	3.060
SIRIKWA	CHEMISTRY	2.191	2.286	2.285714286	2.051	2.454
TESTIMONY	BIOLOGY	5.854	6.909	4.6	5.900	6.656
TESTIMONY	PHYSICS	5.579	4.923	5.1875	7.250	5.539
TESTIMONY	CHEMISTRY	4.634	4.216	5.1875	7.250	5.539
UASIN GISHU	BIOLOGY	8.192	8.077	7.371		
UASIN GISHU	PHYSICS	7.176	7.641	5.766		
UASIN GISHU	CHEMISTRY	7.229	6.349	5.485		
WARENG	BIOLOGY	5.235	5.899	4.69047619	5.126	5.668
WARENG	PHYSICS	6.404	6.548	4.590909091	6.563	5.051
WARENG	CHEMISTRY	4.917	4.737	3.968503937	4.316	3.920

Appendix III KCSE Mean Performance in Sciences 2001-2005

	SCHOOL	2005	2004	2003	2002	2001	MEAN
1	64 SEC	2.543	2.787	2.38	2.397	2.61	2.54
2	ELD. SEC	2.383	2.075	2.683	2.237	.	2.34
3	ELD.MAGEREZA ELDORET	2.799	3.585	.	2.974	3.272	3.16
4	HA RAMBEE	4.735	5.929	6.371	4.876	5.048	5.39
5	KAPSAOS	2.64	2.698	2.579	2.907	2.559	2.68
6	MOI GIRLS MOTHER	9.11	9.03	8.802	9.175	7.91	8.81
7	APOSTLES	8.521	8.4	8.646	.	.	8.52
8	MWIRUTI	3.603	3.406	2.873	3.682	3.15	3.34
9	P.G.C SEC	2.591	3.054	2.876	3.243	2.867	2.93
10	SAGE SEC	2.77	3.334	2.167	3.683	3.009	2.99
11	SIRIKWA	3.053	2.943	2.831	2.706	2.921	2.89
12	TESTIMONY	5.356	5.349	4.992	6.8	5.911	5.68
13	UASIN GISHU	7.533	7.356	6.207	.	.	7.03
14	WARENG	5.519	5.728	4.417	5.335	4.88	5.18

APPENDIX IV: STUDENTS' QUESTIONNAIRE

This is **NOT** an examination. The purpose of these questions is to explore what you think about science performance in school. On the following pages are some questions that require your response. There are no right or wrong answers, all that is required is your personal opinion. Please answer these questions as honestly as you can. Your answers will be kept strictly confidential and please be assured that your teachers will not victimize you for anything written here.

PART I : BACKGROUND INFORMATION

1. I am *(Please tick one number)* Male ☐ Female ☐

2. What science subjects are you doing this year? (*Circle all that apply)*

Biology **1** Chemistry **2** Physics **3**

3. Which one of the subjects above is your favorite?_____

4. What is the average class size in your stream (*Number of students in class*)

5. Whom do you live with at home? *(Please tick all that apply)*

- both parents ☐
- father only ☐
- mother only ☐

6 a) How would you classify your Father's /guardians highest educational level? (*please tick one)*

None		Primary School	
Secondary school		College Diploma	
University Degree		Other (please specify)	

6. b) How would you classify your Mother's/ guardian educational level

None		Primary School	
Secondary school		College Diploma	
University Degree		Other (please specify)	

PART II : INTERESTS AND ABILITY

The next pages of questions ask how often certain things happen during your science lessons at school, or how often certain things are true. There are no right or wrong answers. Please read each sentence carefully then say what you think by putting a circle around the number that is right for you. If you make a mistake, put a cross over it and then circle the right number. Look carefully at the top of each page to see how to choose your answer.

7. How would you rate your interest in Sciences at this time?(please

Not interested at all 1 2 3 4 5 extremely interested

8. How strongly do you want to get the best results in sciences that you can?

Not strongly at all 1 2 3 4 5 Very Strongly

9. How would you rate your ability in the sciences?

Very low 1 2 3 4 5 extremely high

10. Looking back over to KCPE which mark did you get in Science_____?

11. How did you perform in the end of term exams last term? (*Give marks and grade)*

Biology *Mark _____Grade_____*

Physics *Mark _____Grade_____*

Chemistry *Mark _____Grade_____*

12. Which of the following statements best describes your science performance?

(a) I usually get the science results that I want **(b)** I don't usually get the results that I want

©Other_____

13(a) Did you complete the Form Two work in time last year? Yes ☐ ☐

(b) If No to 13(a) above, which topics where left out of the Form 2 work in the different subjects, which you now did in Form 3?

Biology	Physics	Chemistry

PART III: AVAILABILITY OF RESOURCES

14. For the following statements please circle a choice that corresponds to your view on the availability of resources in your school for learning sciences

Key SD=Strongly Disagree , D=Disagree, U=undecided, A=Agree, SA= Strongly Agree

Availability of Resources	**SD**	**D**	**U**	**A**	**SA**
Class textbooks are adequate for sciences	**1**	**2**	**3**	**4**	**5**
We have access to revision books in sciences	**1**	**2**	**3**	**4**	**5**
The school has adequate no. of Laboratories	**1**	**2**	**3**	**4**	**5**
The laboratories are well stocked with chemicals	**1**	**2**	**3**	**4**	**5**
The laboratories are well stocked with equipment	**1**	**2**	**3**	**4**	**5**

15. with general regard to the sciences, how often do these things happen in your science classes?

In my science classes	**Never**	**Once a term or less**	**About once a month**	**About once a week**	**Nearly every lesson**
1. I copy notes the teacher gives me.	1	2	3	4	5
2. I work out explanations in science with friends or on my own.	1	2	3	4	5
3. I have opportunities to explain my ideas.	1	2	3	4	5
4. I read a science textbook.	1	2	3	4	5
5. I watch the teacher do an experiment.	1	2	3	4	5
In my science class	**Never**	**Once a term or less**	**About once a month**	**About once a week**	**Nearly every lesson**
6. We do experiments by following instructions.	1	2	3	4	5
7. We plan and do our own experiments.	1	2	3	4	5
8. We have class discussions.	1	2	3	4	5
9. We learn about scientists and what they do.	1	2	3	4	5
10. We do our work in groups.	1	2	3	4	5

In science we…..	Never	Once a term or less	About once a month	About once a week	Nearly every lesson
11. Do practical work outside in the school compound.	1	2	3	4	5
12. Have filed trips to the zoo, museum, or places like that.	1	2	3	4	5
13. Have visiting speakers who talk to us about science.	1	2	3	4	5
14. Use computers to do our science work.	1	2	3	4	5
15. Look for information on the internet.	1	2	3	4	5
16. Investigate to see if our ideas are right.	1	2	3	4	5
My science teachers…..	**Never**	**Once a term or less**	**About once a month**	**About once a week**	**Nearly every lesson**
17. Tell me how to improve my work.	1	2	3	4	5
18. Give us quizzes that we mark to see how we are going.	1	2	3	4	5
19. talk to me about how I am getting on in science.	1	2	3	4	5
20. let us choose our own topics to investigate.	1	2	3	4	5

16. How often are these things true for your science class?

The science we learn at school	Almost never	Some-times	Often	Very often	Almost always
21. is relevant to my future.	**1**	**2**	**3**	**4**	**5**
22. is useful in every day life.	**1**	**2**	**3**	**4**	**5**
23. deals with things I am concerned about.	**1**	**2**	**3**	**4**	**5**
24. helps me make decisions about my health.	**1**	**2**	**3**	**4**	**5**
25. helps me understand environmental issues.	**1**	**2**	**3**	**4**	**5**
My science teacher					
26. marks our work and gives it back quickly.	**1**	**2**	**3**	**4**	**5**
27. makes it clear what we have to do to get good marks.	**1**	**2**	**3**	**4**	**5**
28. uses language that is easy to understand.	**1**	**2**	**3**	**4**	**5**
29. takes notice of students' ideas.	**1**	**2**	**3**	**4**	**5**

30. shows us how new work relates to what we have already done.	**1**	**2**	**3**	**4**	**5**
In science we need to be able to	**Almost never**	**Sometimes**	**Often**	**Very often**	**Almost always**
31. think and ask questions.	**1**	**2**	**3**	**4**	**5**
32. remember lots of facts.	**1**	**2**	**3**	**4**	**5**
33. understand and explain science ideas.	**1**	**2**	**3**	**4**	**5**
34. recognize the science in the world around us	**1**	**2**	**3**	**4**	**5**
During science lessons	**Almost never**	**Sometimes**	**Often**	**Very often**	**Almost always**
35. I get excited about what we do.	**1**	**2**	**3**	**4**	**5**
36. we have enough time to think about what we are doing.	**1**	**2**	**3**	**4**	**5**
37. I am curious about the science we do.	**1**	**2**	**3**	**4**	**5**
38. I am bored.	**1**	**2**	**3**	**4**	**5**
39. I don't understand the science we do.	**1**	**2**	**3**	**4**	**5**
40. I find science too easy.	**1**	**2**	**3**	**4**	**5**
41. I find science challenging.	**1**	**2**	**3**	**4**	**5**
42. I think science is too hard.	**1**	**2**	**3**	**4**	**5**

17. Please place a tick against the statement which best describes your views on the following items regarding your science teachers?

Key SD=Strongly Disagree, D=Disagree, U=undecided, A=Agree, SA= Strongly Agree

My science teachers …….	**SD**	**D**	**U**	**A**	**SA**
Show respect for all students	**1**	**2**	**3**	**4**	**5**
Are open and receptive to ideas	**1**	**2**	**3**	**4**	**5**
Show sensitivity to individual differences	**1**	**2**	**3**	**4**	**5**
Are punctual for classes in sciences	**1**	**2**	**3**	**4**	**5**
	SD	**D**	**U**	**A**	**SA**
Show expertise in the subject matter	**1**	**2**	**3**	**4**	**5**
	1	**2**	**3**	**4**	**5**

Are current with developments in field Integrate theory with real-world	**1**	**2**	**3**	**4**	**5**
	SD	**D**	**U**	**A**	**SA**
Communicate clearly	**1**	**2**	**3**	**4**	**5**
Communicate candidly and constructively	**1**	**2**	**3**	**4**	**5**
	SD	**D**	**U**	**A**	**SA**
Have advanced my knowledge of the subject	**1**	**2**	**3**	**4**	**5**
Show enthusiasm toward the subject	**1**	**2**	**3**	**4**	**5**
Use helpful examples and references	**1**	**2**	**3**	**4**	**5**
Encourage student interaction	**1**	**2**	**3**	**4**	**5**

18. Please place a mark to correspond to your view with regard to the statement highlighted below on the teaching of sciences.

Overall I find the learning of sciences to be……..

Extremely Good	Somewhat Good	Neither Good nor Bad	Somewhat Bad	Extremely Bad
Extremely Exciting	Somewhat Exciting	Neither Exciting nor Boring	Somewhat Boring	Extremely Boring
Extremely Dull	Somewhat Dull	Neither Dull nor Interesting	Somewhat Interesting	Extremely Interesting
Extremely Useful	Somewhat Useful	Neither Useful nor Useless	Somewhat Useless	Extremely Useless
Extremely Beneficial	Somewhat Beneficial	Neither Beneficial nor Harmful	Somewhat Harmful	Extremely Harmful

19. ***Please write answers to these questions in the spaces provided.***

What are the things that you really like about science in your class?

What are the things that you don't like about science in your class?

How could your science class be improved so that you could learn more?

Based on my experience in science lessons, I believe the reasons for my performance in sciences is

In your view what should be done to improve the students' performance in sciences

Thank you very much for taking your time to fill this questionnaire.

Appendix V Teachers' Questionnaire

Please read the following statements and then respond by placing a check mark (√) or (X) in the box or space that best represents your opinion on the issue addressed in the statement.

PART I DEMOGRAPHICS

Questionnaire

What is your Gender? Check ( ) the one that applies. Male ◯ Female ◯

2. School Name_____

3 (a) What are your main science teaching subject? (please tick one)

(A) Biology ☐ (B) Physics ☐ © Chemistry ☐

(b)How many lessons do you teach per week this term?_____Periods.

4. How long have you been teaching? (Check (( ) the one that applies).

Less than 5 years	_	_16-20 years	
6-10 years	_	_21 years and above	
11-15 years	_		

5. What is your current age?

25-29		30-34		35-39	
40-44		45-50		Above 50	

6.What is your highest level of education?

Diploma ☐ Bachelors Degree ☐

Bachelors (*working on Masters*) ☐ Masters Degree ☐

PART II AVAILABILITY AND UTILIZATION OF RESOURCES

7.Please rate the adequacy of the following teaching resources and facilities

	Availability of resources	**Inadequate**	**Slighltly inadequate**	**Undecided**	**Somehow adequate**	**Adequate**
1	**Laboratories**	**1**	**2**	**3**	**4**	**5**
2	Laboratory chemicals	**1**	**2**	**3**	**4**	**5**
3	Laboratory equipment	**1**	**2**	**3**	**4**	**5**
4	Laboratory Assistant(s)	**1**	**2**	**3**	**4**	**5**
5.	Reference Books	**1**	**2**	**3**	**4**	**5**
6.	Revision Books	**1**	**2**	**3**	**4**	**5**

Please circle the statement that best describes who are involved in planning for purchase of science materials. *(please tick all that apply)*

Head teacher alone ☐ Subject teachers' ☐

H.O.D. alone ☐ Laboratory assistant ☐

Please circle the statement that best describes who are involved in purchasing science materials *(please tick all that apply*

Head teacher alone ☐ Subject teachers' ☐

H.O.D. alone ☐ Laboratory assistant ☐

PART III TEACHING METHODS

8. Please rate your utilization of the following teaching methods in science instruction? (*Please tick one)*

Teaching Method	**Never**	**Occasionally**	**Termly**	**Weekly**	**Daily**
Lecture Method					
Class Discussion					
Asking Questions					
Laboratory Activities					
Project Work					

9. **How have the following sources assisted you in teaching of sciences**? (Please place a mark alongside the scale value which best describes your response)

	Never			Some what			A great Extent
University /College training	1	2	3	4	5	6	7
SMASSE in-service courses	1	2	3	4	5	6	7
Workshops from DEO's office	1	2	3	4	5	6	7
School Workshops	1	2	3	4	5	6	7
KIE new curriculum implementation courses	1	2	3	4	5	6	7

10. Based upon what you have seen, heard, and experienced, please rank the following sources of teacher support services in terms of usefulness in the teaching of sciences.

*(Place a "**1**" next to the brand that is most useful, a "**2**" next to the brand that is next most reliable, and **so on up to 5.**. Remember, no two sources can have the same ranking)*

Source	Rank
School Workshops	
SMASSE in-service courses	
Workshops by DEO's office	
University /College training	
New curriculum implementation KIE courses	

11. Which of the following categories best describes your experience while performing the listed teaching tasks with regard to sciences
Would you say that your experience was:

Teaching Experience	Very pleasant	Somew hat pleasant	Neithe r	Somewha t Unpleasa nt	Very unple asant
Giving and Marking of Assignments					
Class Discussion					
Organization of class experiments					
Conducting practical in the laboratory					
Supervision of cleaning after experiments					
Project Work					
Participation in Science congress					

PART III: ATTITUDE TO SCIENCES

Please place a mark to correspond to your view with regard to the statement highlighted below on the teaching of sciences.

Overall I find the teaching of sciences to be……..

Extremely Good	Somewhat Good	Neither Good nor Bad	Somewhat Bad	Extremely Bad
Extremely Exciting	Somewhat Exciting	Neither Exciting nor Boring	Somewhat Boring	Extremely Boring
Extremely Dull	Somewhat Dull	Neither Dull nor Interesting	Somewhat Interesting	Extremely Interesting
Extremely Useful	Somewhat Useful	Neither Useful nor Useless	Somewhat Useless	Extremely Useless
Extremely Beneficial	Somewhat Beneficial	Neither Beneficial nor Harmful	Somewhat Harmful	Extremely Harmful

PART IV : LEADERSHIP STYLES

Please rate the management style of your Head teacher *(Please tick one)*

Participative ☐ ☐ Leissez fair ☐ Dictatorial

PART V

12. Please read the following statements carefully and for each statement, circle a number from 1 to 7 which best describes your views on the statements.

		Strongly Disagree	Disagree	Un-decided	Agree	Strongly Agree
	Causes of Poor Perfomance	**SD**	**D**	**U**	**A**	**SA**
1	There is poor motivation which affects my classroom delivery	**1**	**2**	**3**	**4**	**5**
2	Our school selects students with very low marks at KCPE	**1**	**2**	**3**	**4**	**5**
3	The poor working relationship between teachers and students contributes to the performance in sciences	**1**	**2**	**3**	**4**	**5**
4	The poor working relations with the Head-teacher affect performance of sciences	**1**	**2**	**3**	**4**	**5**

5	The leadership style of the Head-teacher contributes to the low performance	**1**	**2**	**3**	**4**	**5**
6	Special preference is given to other subject by the Head-teacher	**1**	**2**	**3**	**4**	**5**
7	Lack of time for students to practice science activities contributes to poor performance	**1**	**2**	**3**	**4**	**5**
8	I have such a heavy workload that it affects the students performance in sciences	**1**	**2**	**3**	**4**	**5**
9	The learners assume sciences are hard to pass	**1**	**2**	**3**	**4**	**5**
10	There is poor discipline among students and it affects performance in the sciences	**1**	**2**	**3**	**4**	**5**
11	My employers' pay package demotivates me from giving my best	**1**	**2**	**3**	**4**	**5**
	Management Issues	**SD**	**D**	**U**	**A**	**SA**
12	There is adequate Supervision of teaching of sciences by the HOD	**1**	**2**	**3**	**4**	**5**
13	There is adequate Supervision of teaching of sciences by the Head teacher	**1**	**2**	**3**	**4**	**5**
14	We teachers do work as a team in the teaching of sciences	**1**	**2**	**3**	**4**	**5**
15	Delegation of academic duties are done efficiently	**1**	**2**	**3**	**4**	**5**
16	Lessons are shared in a democratic way , whereby I am involved	**1**	**2**	**3**	**4**	**5**
17	I am involved in decision making on matters pertaining to the teaching of sciences	**1**	**2**	**3**	**4**	**5**
18	I am involved in the requisition of science chemicals and apparatus	**1**	**2**	**3**	**4**	**5**
	Syllabus Coverage	**SD**	**D**	**U**	**A**	**SA**
19	I am able to complete the form 4 syllabus in time	**1**	**2**	**3**	**4**	**5**
20	My students are aware of the progress of syllabus coverage	**1**	**2**	**3**	**4**	**5**
21	I was able to complete the form three topics before the end of the last year.	**1**	**2**	**3**	**4**	**5**
22	I find the syllabus to be too broad	**1**	**2**	**3**	**4**	**5**

(d) What would you suggest should be done to further improve students' performance in sciences?

_____

_____

_____

Thank you very much for taking your time to fill this questionnaire.

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Email address (optional)

APPENDIX VI- DATA COLLECTION LETTER-

HEADTEACHERS
DEAR SIR/MADAM,

RE: **COLLECTION OF DATA ON SCIENCE PERFOMANCE**

Hi! My name is Mabel Mudulia and I am currently a graduate student at Moi University. I'm carrying out a research in an area that is of great concern to me and the general teaching fraternity: what factors influence performance in science subjects? This study presents an opportunity for an exploration of these diverse factors. Your honest response will be of great value in completing the research process.

I am therefore requesting for your voluntary participation in my research. If you agree to participate, the enclosed questionnaire should take no longer than 20 minutes to complete. By completing the questionnaire you are signifying your informed consent to participate and granting the researcher permission to utilize the data. If at any time you feel uncomfortable in answering a question, skip that question and move to the next or you may withdraw from this study entirely, without any penalty or consequence.

All individual responses and specific school identities will be kept strictly confidential. The researcher is the only person allowed to keep, examine, and analyse the data in its original form. Should you wish to get an electronic copy of the research findings, please indicate your e-mail address in the space provided at the end of the questionnaire? If you have any questions please contact me on 0722909133 or email me at mabelmudulia @yahoo.com

I hope you find this survey an interesting and worthwhile experience.

Yours sincerely

MABEL MUDULIA

Appendix VII Head-Teachers' Questionnaire

Please read the following statements and then respond by placing a check mark (√) or (X) in the box or space that best represents your opinion on the issue addressed in the statement.

PART I DEMOGRAPHICS

1.What is your Gender? Tick (( ) the one that applies. Male ◯ male ◯

2. School Name_____

3 (a) What are your teaching subjects? Major_____Minor_____

3(b)How many lessons do you teach per week this term?_____Periods.

4(a)How long have you been teaching? (Tick (( ) the one that applies).

Less than 5 years	_	16-20 years	_
6-10 years	_	21 years and above	_
11-15 years	_		

4(b) How long have you been the Head-teacher in your present station?_____years

25-29		30-34		35-39	
40-44		45-50		Above 50	

5. What is your current age?

6. What is your highest level of education?

Diploma ☐ Bachelors Degree ☐

Bachelors (*working on Masters*) ☐ Masters ☐

7. Please classify the category of your school *(please tick all that apply)*

Public_____Private_____

Boarding _____Day _____ Mixed Boarding and Day_____

Boys_____Girls _____ Mixed_____

8. What was the cut off points for admission into Form one in 2007?_____

9.What number of streams do you have in form 4?_____

10. (a) How many teachers are in the science department?_____

(b) What is their gender ratio? Male _____Female_____

© Do you consider the staff establishment adequate for the sciences?

Yes_____ No_____

(d) If No to © above, how do you cope with the staff deficit?

_____

_____

11. Please rate the adequacy of the following teaching resources and facilities

	Availability of resources	**Inadequate**	**Slighltly inadequate**	**Undecided**	**Somehow adequate**	**Adequate**
1	**Laboratories**	**1**	**2**	**3**	**4**	**5**
2	Laboratory chemicals	**1**	**2**	**3**	**4**	**5**
3	Laboratory equipment	**1**	**2**	**3**	**4**	**5**
4	Laboratory Assistant(s)	**1**	**2**	**3**	**4**	**5**
5	Reference Books	**1**	**2**	**3**	**4**	**5**
6	Revision Books	**1**	**2**	**3**	**4**	**5**

12(a) Please circle the statement that best describes who are involved in planning for purchase of science materials. *(please tick all that apply)*

Head teacher alone ☐ Subject teachers' ☐
H.O.D. alone ☐ Laboratory assistant ☐

(b)Please circle the statement that best describes who are involved in purchasing science materials *(please tick all that apply*

Head teacher alone ☐ Subject teachers' ☐
H.O.D. alone ☐ Laboratory assistant ☐

13. Based upon what you have seen, heard, and experienced, please rank the following sources of teacher support services in terms of usefulness in the teaching of sciences.

*(Place a "**1**" next to the brand that is most useful, a "**2**" next to the brand that is next most*

*reliable**, and so on up to 5**. Remember, no two sources can have the same ranking)*

Source	Rank
School Workshops	
SMASSE in-service courses	
Workshops by DEO's office	
University /College training	
New curriculum implementation KIE courses	

PART IV : LEADERSHIP STYLES

14. How would you classify your management style *(Please tick one)*

Task centered ☐ People centered ☐

15. Has the school experienced a strike in the last three years? Yes ___No____

16. How would you rate the severity of the following indiscipline cases amongst your students? *(Please tick one in each category of cases)*

	Very common	Slightly Common	Undecided	Not Common
Bullying				
Smoking				
Fighting				
Petty Thefts				
Abusive Language				
Sneaking				
Lateness				
Drunkenness				
Love Affairs				

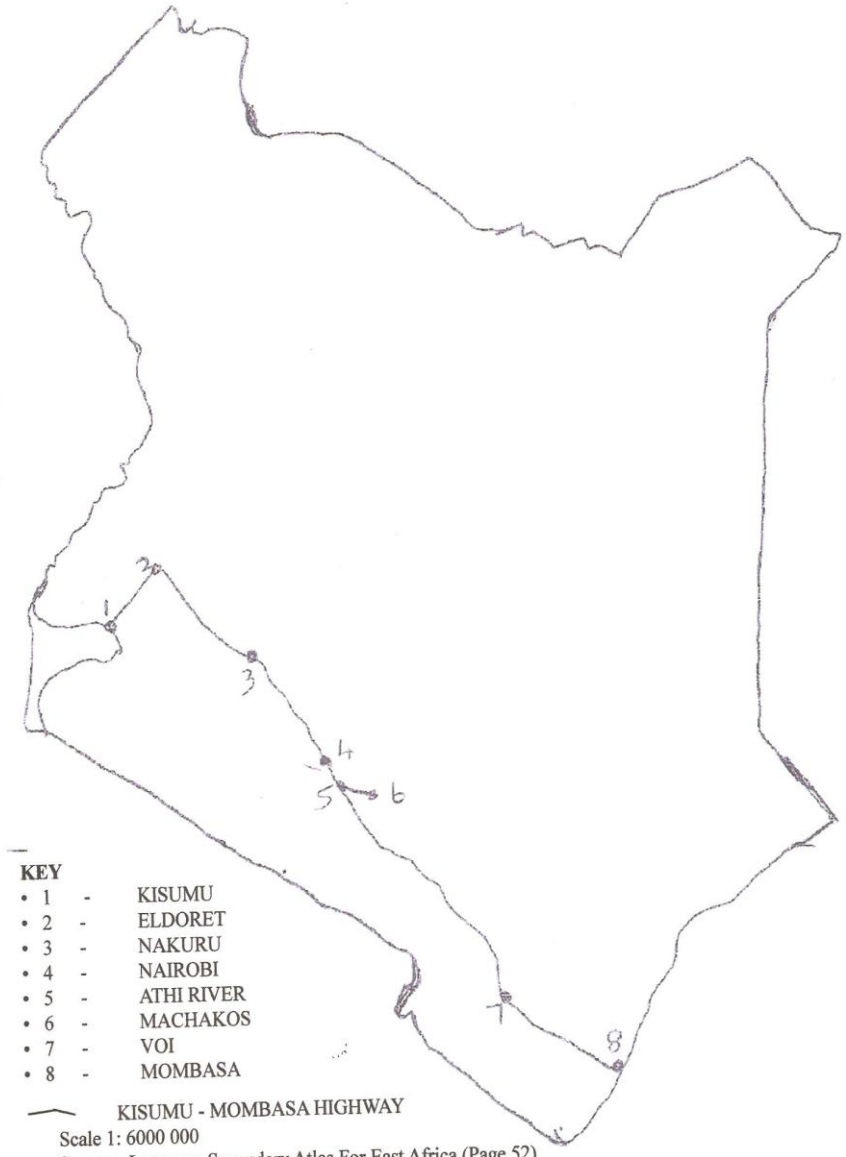
(18) What would you suggest should be done to further improve students' performance in sciences?

_____

_____

Thank you very much for taking your time to fill this questionnaire

APPENDIX VIII MAP OF KENYA SHOWING THE LOCATION OF ELDORET.



KEY

- 1 - KISUMU
- 2 - ELDORET
- 3 - NAKURU
- 4 - NAIROBI
- 5 - ATHI RIVER
- 6 - MACHAKOS
- 7 - VOI
- 8 - MOMBASA

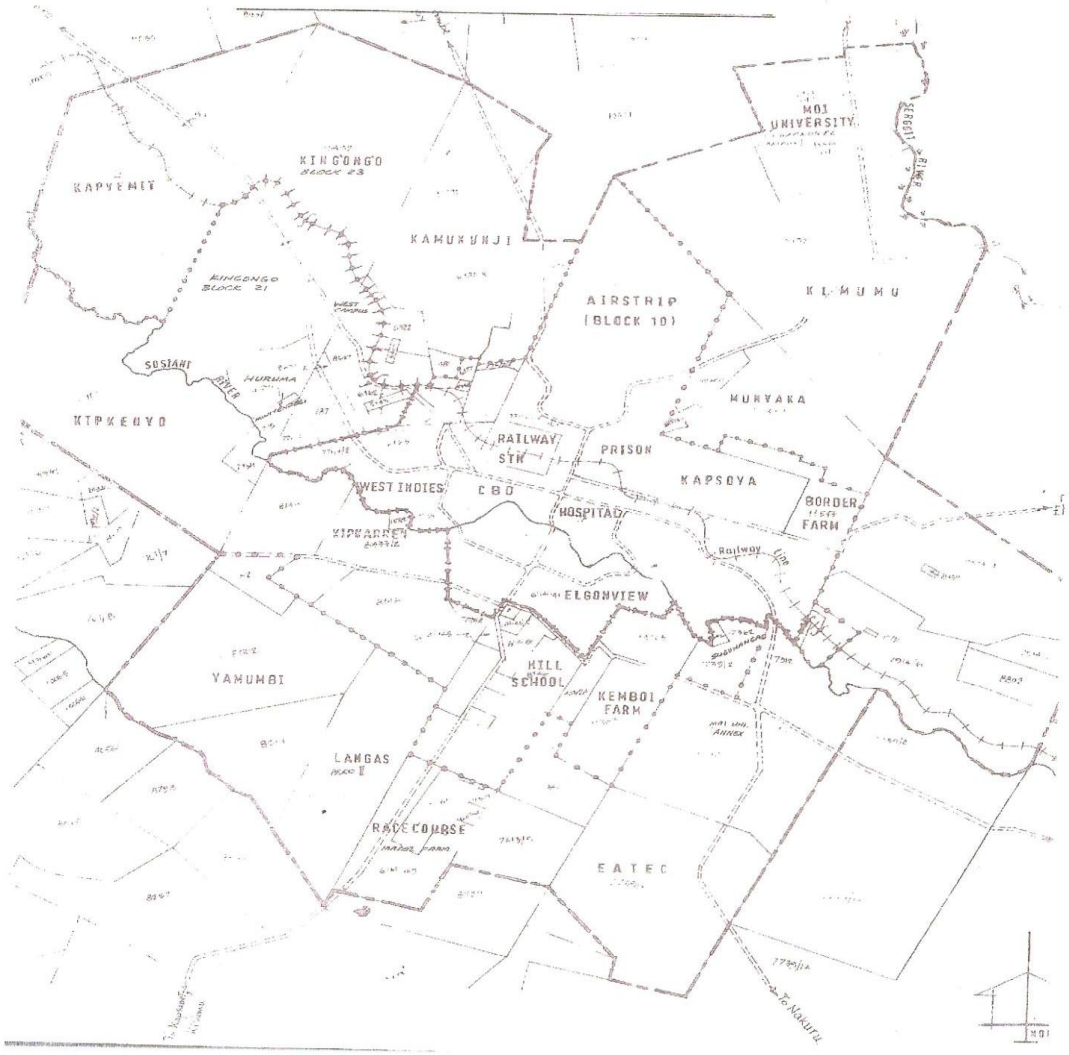
KISUMU - MOMBASA HIGHWAY

Scale 1: 6000 000

Source: Longman Secondary Atlas For East Africa (Page 52)

APPENDIX IX: ELDORET MUNICPALITY

ELDORET SCALE 1:50 000



APPENDIX X: RESEARCH PERMIT

PAGE 2

HIS IS TO CERTIFY THAT:

Dr./Prof./Mr./Mrs./Miss AMBOGO

ABEL MUDULTA

(Address) MOI UNIVERSITY

P.O. BOX 3900 ELDORET

has been permitted to conduct research in

ELDORET MUNICIPALITY District/Location

UASIN GISHU Province

RIFT VALLEY Province

on the topic FACTORS THAT INFLUENCE

PERFORMANCE IN KCSE SCIENCE

SUBJECTS: A CASE STUDY OF SELECTED

SECONDARY SCHOOLS IN ELDORET

MUNICIPALITY

Applicant's Signature

FOR: PERMANENT SECRETARY

MINISTRY OF EDUCATION

SCIENCE AND TECHNOLOGY

PAGE 3

Research Permit No. MOST 13/001/37C 40

Date of issue 31/1/2007

Fee received: SHS. 500.00

FOR: PERMANENT SECRETARY

MINISTRY OF EDUCATION

SCIENCE AND TECHNOLOGY

Permanent Secretary

Ministry of