FACTORS INFLUENCING GIRLS' PERFORMANCE IN MATHEMATICS AND SCIENCE SUBJECTS IN THE KENYA CERTIFICATE OF SECONDARY EDUCATION IN PUBLIC SECONDARY SCHOOLS IN WESTLANDS DISTRICT, NAIROBI COUNTY, KENYA

BY

RAUTTA CATHERINE AWUOR

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DECLARATION

This research project report is my original work and has not been submitted for a degree in any other university.

Signature: ..... Date: .....

Rautta Catherine Awuor

REG NO. L50/62241/2011

This research project report has been submitted for examination with my approval as the university supervisor.

Signature: ..... Date: .....

Prof Timothy Maitho

Department of Public Health, Pharmacology and Toxicology

University of Nairobi

DEDICATION

This project is dedicated to my wonderful and loving parents Mr and Mrs Rautta who have encouraged me every step of the way and to my siblings Anthony, Patric, Louisa, Hezron and James for their constant support and love.

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ABRREVIATIONS AND ACRONYMS

BBC	British Broadcasting Corporation
DQAS	Directorate of Quality Assurance Scheme
EFA	Education for All
FAWE	Forum for African Women Educationalists
FME	Federal Ministry of Education
JAB	Joint Admissions Board
KCPE	Kenya Certificate of Primary Education
KCSE	Kenya Certificate of Secondary Education
KNEC	Kenya National Examination Council
MDG	Millennium Development Goal
MOE	Ministry of Education
SACMEQ	Southern and Eastern Africa Consortium for Monitoring Educational Quality
SPSS	Statistical Package for Social Sciences
UBEC	Universal Basic Education Commission
UCE	Uganda Certificate of Education
UNEB	Uganda National Examination Board
UNESCO	United Nations Educational Scientific and Cultural Organization
UNGEI	United Nations Girl Education Initiative
UNICEF	United Nations Children's Fund (formerly United Nations Children's Emergency Fund)
UN	United Nation
UPE	Universal Primary Education
USAID	US Agency for International Development

ABSTRACT

The purpose of this study was to find out the factors influencing girls' performance in science subjects in the national examination of Kenya Certificate of Secondary Education in secondary schools in Westlands District, Nairobi County. The study was guided by the following objectives; to assess girls' performance in mathematics and science subjects in national examinations, to assess boys' performance in mathematics and science subjects in national examinations, to examine challenges faced by girls in achieving their potential in mathematics and science subjects, to assess strategies that could be adopted in order to improve girls' performance in mathematics and science subjects. The study employed a descriptive survey research design based on a cross sectional descriptive research and data was collected using questionnaires administered to 218 students, teachers and head-teachers of ten secondary schools in Westlands District, Nairobi County. Data was analysed using Statistical Package for Social Sciences. The findings indicated that the boys performed better in mathematics and sciences in the KCSE. However, in aggregate, the girls appeared to perform better. A total of 43.3% of the girls and 36.5% of the boys who sat for KCSE in 2011 qualified to join public university. Majority of the boys qualified for enrolment in science based courses while majority of the girls qualified for enrolment in arts based courses. The preference for science subjects was also high among the boys as compared to girls. 32.7% of the girls said that lack of interest in maths and sciences contributed to their poor performances and 42.6% said that the learning environment affected their performances. Lack of teaching apparatus contributed to poor performance among 52.5% of the girls. 30.7% of the girls said that they lack qualified teachers while 51.5% criticized on the biased instruction methods. 75.3% of the girls admitted that lack of proper preparation for examinations lead to their poor performance while incompletion of the syllabus affected the performance of 63.4% of the girls. 51.5% of the girls said that their parents were not fully concerned about their academics. Lack of vocational guidance and career counselling contributed to poor performance according to 66.6% of the female students. Parental involvement, regular assessments tests, refresher course and workshops for teachers, provision of adequate teaching resources, career counselling are effective strategies which can be used to improve the girls' performance in mathematics and science subjects. Findings of the study will be useful to the Ministry of Education, school managers and other stakeholders.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Performance of girls in mathematics and science subjects in Kenyan schools has been a persistent problem. It is generally agreed that in the current knowledge economy society, science, technology and innovation play a major role towards the achievement of the Millennium Development Goal number 3; achieve universal primary education. Several factors contribute to the low participation and performance of girls and women in science and technology education and science based activities in Kenya and their lack of motivation for learning science and technology. These include lack of relevant policies, inadequate curriculum content and delivery, biased teaching materials and negative socio-cultural attitudes and practices. It is therefore agreed that achievement of gender parity in science and technology should rely on an appropriate mix of strategies based on lessons learned from best practices and experiences at national, regional and international levels.

More boys than girls tend to opt for scientific and technological subjects in schools. Their performance in these subjects tends to be better than girls as well. After school, boys more than girls, tend to pursue careers in the field of science and technology. This is a worldwide phenomenon, common to variety educational systems and hence is a much researched phenomenon and there is evidence that where research recommendations are reflected in practice, the disparities can be reduced.

The under-representation and under-achievement of girls in science and technology subjects can be seen as a serious inefficiency in educational systems in countries whose development depends crucially on the generation of human technological capacity. This is the case in most African countries. If only more girls could be persuaded to take up science and technology subjects in schools, and could be persuaded to do better in them, the countries, so the argument goes, would have the benefit of an increased technological output with few extra inputs.

Results for the 2011 Uganda Certificate of Education (UCE) examination indicated that sciences continued to be poorly performed compared to the arts. According to Uganda National

Examination Board (UNEB) Executive Secretary Mathew Bukenya (2012), nearly three quarters of the candidates didn't pass Chemistry and Biology. He observed that while marking the examinations, evidence pointed to candidates' failure to finish subject syllabus and lack of practical knowledge for scientific experiments.

There are also strong educational and social arguments why this issue should be addressed. The well-known theme of 'innate differences' still makes its way into public discussions (even some women hide behind this argument) and into some popular scientific reviews. However, as Catherine Vidal, a neurobiologist and laboratory head at the Pasteur Institute points out, 'there is no scientific proof that can show any innate differences between male and female brains'. Some tests do show differences such as a greater aptitude of boys for spatial coordination, but one can still argue that these are acquired differences perhaps, for example, they are due to playing more outdoor games. Sometimes the arguments about hormones are put forward but no one has ever been able to prove that these make boys more intelligent.

When girls opt for the sciences stream, the figures show that they perform well here and that many girls are wrongly guided towards a literary stream after a purely mechanical judgment of their aptitudes. It does seem that girls have a less clear vision of what the goal of their studies should be. They claim more often than boys to have chosen the direction of their studies according to their personal preferences and not on the grounds of their professional future. They show themselves to be less certain of themselves when they are confronted with mathematics and other sciences. Where they are of equal ability in a class, a girl will hesitate before choosing to follow a science stream, while a boy has less fear of being able to cope with the difficulties, because of the need for him to justify what is regarded in our societies as his male ego.

Within the family circle, the girl suffers from the traditional concepts that parents have of girls. It can be seen all too frequently that her domestic duties get in the way of her homework. Domestic duties compete for her time with study and revision at home. The moment she gets back home, she starts on domestic tasks, and as she gets bored, she gives less and less time to her school homework particularly to mathematics, which needs great concentration.

In some families, when times are hard, girls are neglected, and preference is given to the boys. The family income sometimes cannot support keeping all children at school. Priority is then

given to the needs of the boy(s). And for some parents, the main duty of girls is to get a husband and produce children. Academic problems are not the only kind of problems that reduce girls' motivation to pursue scientific subjects. At school, most boys prefer to work without girls, because they don't think the girls are prepared to put forth enough effort, particularly in mathematics, a subject where plenty of concentration and steady willingness to work is regarded as essential. Even when the girls are ready to work, the timetable for group studies disadvantages them, since the girl also has to include domestic duties among the work she has to do.

A different problem can sometimes lead to poor academic performance among girls. This is the attitude of some mathematics and physics teachers, who benefit from their positions to divert girls from their school work by practices that have little to do with education, such as threatening girls with poor reports, if they do not provide them with sexual favours, regarding the role of a teacher as simply a means of making a living, without attaching any particular importance to it, showing little interest in how well pupils do or in ways and means that could encourage pupils to do better work and underestimating the special problems girls face because of gender inequality. Teachers cannot play their full role unless they seek to be aware of the conditions that would help pupils to show interest in their studies as well as those conditions that reduce pupils' motivation.

1.2 Statement of the Problem

The need to learn mathematics and science subjects in today's science-oriented, computerized world - in order to comprehend the era's technology and strengthen the base of research, on the one hand, and the importance of women as half of the divine capital and society's intellectual resources on the other justifies the need for the study of this subject.

Rapid growth, new developments and technology have made the acquisition of new and substantial information and skills in order to increase the ability to adapt to the changing conditions of life, understand the era's technology and scientific knowledge imperative for all. Along these lines, some subjects, such as mathematics, physics, chemistry and biology demand greater attention and investment in society's educational plans. This is especially true in the world today which becomes more computer and math oriented by the hour. Considering their fundamental nature and their influence in the growth and development of thought, strengthening

the foundations of research, sciences are of great importance. This is presently why mathematics is practically the only subject which is taught in every school around the world. Unfortunately, despite absorbing a wealth of human and financial capital from the society, family and government, sciences prove to be the most problematic subjects. Girls, in this regard, display greater difficulties. In many developing countries and even in most parts of the industrialized world, girls show a lower level of performance than boys and associate negative connotations to these subjects in general. This study sought to find out the reasons for the dismal performance by girls in science subjects especially in national examinations such as the Kenya Certificate of Secondary Education and what can be done to reverse this trend to be one of exceptional results in science subjects for girls in secondary schools.

1.3 Purpose of the Study

The purpose of this study was to determine girls' performance in mathematics and science subjects in Kenya Certificate of Secondary Education and assess strategies which would be used to improve girls' performance in the examination.

1.4 Objectives of the Study

The general objective of the study was to determine girls' performance in mathematics and science subjects in Kenya Certificate of Secondary education.

The specific objectives of the study were:

1. To establish girls' performance in mathematics and science subjects in Kenya Certificate of Secondary Education in public secondary schools in Westlands District, Nairobi County.
2. To assess boys' performance in mathematics and science subjects in Kenya Certificate of Secondary Education in public secondary schools in Westlands District, Nairobi County.
3. To examine challenges faced by girls in mathematics and science subjects in public secondary schools in Westlands District, Nairobi County.
4. To assess strategies that can be adopted in order to improve girls' performance in mathematics and science subjects in public secondary schools in Westlands District, Nairobi County.

1.5 Research Questions

The study was guide by the following questions;

1. How do girls perform in mathematics and science subjects in national examinations in public secondary schools in Westlands District, Nairobi County?
2. How do boys perform in mathematics and science subjects in public secondary schools in Westlands District, Nairobi County?
3. What are the challenges faced by girls in achieving their potential in mathematics and science subjects in Westlands District, Nairobi County?
4. What strategies can be adopted to improve girls' performance in mathematics and science subjects in Kenya Certificate of Secondary Education in Westlands District, Nairobi County?

1.6 Significance of the Study

The findings of this study added to the existing body of knowledge about students' abilities in practical aspects of mathematics and science subjects at the Kenya National Examinations Council. Using this knowledge, stakeholders and especially teachers of science subjects may understand better how boys and girls differ in their performance of practical skills. This will enable them to devise techniques that may maximize the benefits of training in practical skills for both boys and girls. Also, Kenya National Examination Council (KNEC) examiners, mathematics and science subject teachers will be able to set examinations that take into account any differences in the abilities of boys and girls in the performance of practical skills.

School management and other stakeholders should develop mentorship programmes that will motivate and encourage students and especially girls to take up mathematics and science subjects. The notion that technology is a male field should be driven out.

1.7 Limitations of the Study

The research instrument gave varying data depending on the individual or the school where it was used. The shortcoming was addressed by applying both quantitative to qualitative approaches to research.

Due to technological dynamism, changes in lifestyle, government legislation and policies, devolution and changes in the education sector, girls' performances in mathematics and science may change within a short time, rendering the research findings obsolete. Also, the study was carried out in Westlands District in Nairobi County, where resources can be said to be adequate. This means that the results may not be generalised to rural and remote areas where school infrastructure and other resources are scarce.

1.8 Delimitation of the Study

The study wasconducted in public secondary schools in Westlands District and focused on girls.

1.9 Basic Assumptions of the Study

It was assumed that the students, teachers and head teachers of secondary schools in Westlands District, who were the respondents in this study, would be available for the research and that they possessed relevant knowledge that would help the researcher to make accurate conclusions. This was actually confirmed following the high rate of return and the information they provided was adequate and it enabled the researcher to make accurate, valid and reliable conclusions.

1.10 Definitions of Significant Terms

Gender differences These are differences as a result of being either female or male, arising from social construction of roles associated with sex differences.

Gender mainstreaming The public policy concept of assessing the different implications for women and men of any planned policy action, including legislation and programmes, in all areas and levels. Mainstreaming essentially offers a pluralistic approach that values the diversity among both women and men.

Kenya Certificate of Secondary Education The examination is taken at the completion of Secondary Education.

Practical skills These will also be referred to as process skills. These mean experimental skills such as observation, recording, manipulation, analysis and interpretation.

Public Secondary Schools Secondary school is a term used to describe an educational institution where the final stage of schooling, known as secondary education takes place. It follows elementary or primary education, and may be followed by university (tertiary) education.

Science Subjects These are subjects that are part of the curriculum and constitute part of the core and compulsory subjects. The subjects offered are Mathematics, Chemistry, Biology, Physics and Computer.

1.11 Organisation of the Study

The study consists of five chapters. Chapter one contains the background of the study, research objectives, questions and the purpose for conducting this study, the significance of the study, the limitations, delimitation, and assumptions of the study and definition of key and relevant terms. Chapter two is a review of literature on global, regional and the Kenyan perspective on girls education, factors that influence girls academic performance, girls' performance in mathematics and sciences in Kenya Certificate of Secondary Education, boys' performance in mathematics and sciences in Kenya Certificate of Secondary Education, challenges facing girls in the pursuit of education, strategies for improvement of girls education, solutions to girl-child education issues, conceptual framework and lastly knowledge gap. Chapter three focuses on the methods of carrying out research. It outlines the research design, target population, sampling procedure, methods of data collection, validity of instruments, reliability of instruments, methods of data analysis, ethical issues and operational definition of variables. Chapter four covers data presentation, analysis and interpretation. Chapter five focuses on the summary of findings, discussion of the findings, conclusions, recommendations and lastly suggestions for further studies.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter provides an overview of the literature that informs the research and that has implications on the findings. This chapter is divided into the following sub sections: global perspective on girls' education where the millennium development goals related to this study are also reviewed; regional perspective on girls' education is discussed; the Kenyan situation, factors influencing girls academic performance, the performances of girls and boys mathematics and science subjects in national examinations, challenges facing girls in achieving their potential in sciences, strategies for improvement of girls education, solutions to the girl-child education issues; the conceptual framework that guides the study and knowledge gap that this study entails to fill is highlighted in the final section.

2.2 Global Perspective

The current development policy emphasis on human resource development in general and female education in particular, is largely in terms of economic efficiency and social welfare arguments. The rationale for investment in education tends to be based on economic arguments about rates of return and efficient allocation of resources. An extension of this argument is that investment in education provides social benefits which are not captured by individuals' or households, and which therefore justify state subsidies to education. This argument is used particularly to justify greater subsidies to female education since it is held that social benefits to female education (e.g. reduced fertility, improved health etc.) are greater than those to male education (Herz et al, 1991; King and Hill, 1991).

2.2.1 Millennium Development Goals in education

The Millennium Development Goals (MDGs) are eight international development goals which all the 193 United Nations member states and at least 23 international organizations have agreed to achieve by the year 2015. The second goal deals with achieving universal primary education and the third goal deals with promoting gender equality and empowering women. Education is

key to achieving the Millennium Development Goals. The education of girls must be mainstreamed within a nation's education system.

Related to Girls' Education, the Millennium Development Goals sets the following targets: to ensure that by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling and eliminate gender disparity in primary and secondary education preferably by 2005 and to all levels of education not later than 2015.

The Millennium Development Goals on education and gender equality reinforce previous international agreements most notably the Education for All Conference in 1990, and the Dakar World Education Forum in 2000 that launched the Secretary-General's United Nation Girls Education Initiative, to which practically all countries have subscribed. The United Nations Girls' Education Initiative works to fulfil these goals. The Millennium Declaration, endorsed by 189 governments and 147 heads of state, represents a wider and more authoritative consensus which UNGEI, with its quantitative and qualitative objectives, can both support and benefit from. The declaration puts the goals related to poverty and development in the context of rights based approach, and, very clearly, makes reaching people the centrepiece of its vision. The MDG "roadmap" presented to the 2001 General Assembly, emphasizing the "people" focus, estimates that, in the year 2000, there were 113 million children of primary school age not in school, of whom about 68 million are girls. These children are the main targets of the declaration, together with the cohorts who will be denied school entry and completion in succeeding years. Girls' education needs to be addressed in a broader context that acknowledges the need to fight against hunger, rural poverty or other barriers to gender equity.

2.2.2 Global overview of education and gender in Asia

Discussion of Asia and the Pacific as a region is problematic, given the wide variation in levels of economic development, overall levels of educational enrolment and gender parity in enrolment. South Asia is clearly the sub-region with the poorest performance, with the exceptions of Sri Lanka and the Maldives. East Asia fares best, with Taiwan, Korea, Hong Kong, and Singapore reaching levels of education on a par with western industrialised market economies. In South East Asia, general education levels are also relatively high in most countries

and gender disparity not wide; with the exceptions of Papua New Guinea and the Solomon Islands, primary enrolment ratios and literacy rates are high in the Pacific.

South Asia is the region where, apart from Sub-Saharan Africa, girls' education lags most severely behind boys'. Further, gender differences in primary level enrolment range from 15% to 50% points. There has been considerable expansion of enrolments between 1960 and1987 (from 51 to 78 percent at primary level) but progress has been slower than in most regions and educational expenditure in the region remains low. At post-primary level South Asia has the widest gender gap of any third world region (Khan, 1991). One third of boys but only one fifth of girls attend secondary school - this is the cumulative effect of disadvantage at primary level and of high dropout rates of girls - although data in this area are scanty (Hertz et al, 1991).

Poor education indicators and wide gender disparities in South Asian countries in part reflects their low per capita incomes, agrarian based economies and relatively low female labour force. Participation rates in most South Asian countries are a function of low educational spending, and pervasive patterns of sex segregation and gender discrimination. Low female life expectancy and imbalance in sex ratios in the population have been widely documented in the region, reflecting patterns of gender discrimination in the allocation of food and spending on health. Socio-cultural factors restricting women's mobility and autonomy (e.g. purdah, dowry, early marriage) are also major constraints to women's participation in education in the region.

East Asia has the fastest economic growth rate of 17% and the highest education level of any third world region. Most countries in the region fall into the middle income category (excluding Cambodia, China, Laos and Viet Nam, which are low income countries). However, within the region, there is a wide range of income levels, from US $200 (1992 estimate) in Cambodia (EIU, 1993) to US $7410 in Singapore (1987). The fast economic and technological growth in East Asian countries is in part a result of their relatively high levels of education and growing pool of post-primary educated workers. In this region, there is near universal primary education and two thirds literacy on average. Sri Lanka and the Maldives are exceptions to the regional pattern. Recent developments in the methodologies for conceptualising women's work and collecting data on female labour force participation and economic activity of women has led to some upward revision of activity rates in Asia as elsewhere.

2.3 Regional Perspective

Most Africans do not have adequate access to education. Access to education opportunity provides for the girl-child to be educated. It deals with the availability, convenience and ability to be educated. It is true that many governments make provision for the education of their citizens, but the provisions most of the time do not take cognizance of the peculiarities of the girl-child. In that case the girl-child may not have access to education, which is a fundamental human right.

The education of the African girl-child can lead to greater stability and improved standards of living. The current state of education in Africa is plagued by a lack of funds, teachers, and textbooks. Primary school enrollments and literacy rates in Africa are among the lowest in the world. 42 million school children in sub-Saharan Africa are not enrolled in school (USAID, 2002). Many children cannot afford to go or stay in primary school. Classroom instruction and textbooks are still the primary methods used for formal teaching and learning in African countries.

Due to the power struggles and uncertainty in the African society, people migrate from town to town frequently. Traditional learning methods such as classrooms or textbooks do not accommodate this nomadic behaviour of the African population. Furthermore, people need to work in the fields or help out with family chores. Children also start working at a young age. People in this environment simply do not have time to attend classroom on a daily basis.

The numbers of children with access to basic education in Sub-Saharan Africa have increased substantially over the last two decades but many still remain out of school. Some fail to enrol at all, especially in fragile states, and many more start school but do not complete the basic cycle. Education for All (EFA) and the Millennium Development Goals (MDGs) have generated commitments to improve greatly access to education.

Research has shown that millions of girls do not have access to school despite the concerted efforts to push the cause forward. Okeke et al.(2008) identified child labour, poverty and lack of sponsorship, quest for wealth, bereavement, truancy, broken home, engagement of children as house helps, as factors or the clog in the wheel of children's access to education in the UNICEF

A-Field made up of Abia, AkwaIbom, Anambra, Bayelsa, Benue, Cross River, Ebonyi, Enugu, Imo and River states of Nigeria. According to World Bank (2003), more than 350 million people, over half Africa's population, live below the poverty line of one dollar per day. This implies that poverty excludes children, including the girl-child, from school.

In Ethiopia, girls are sometimes abducted for marriage when they are no more than eight years. In West Africa, they are recruited from poor rural families to work as domestic servants in coastal cities or even neighbouring countries. In Nigeria it is very difficult to find a house help today. This is because there is awareness of the values of education, and so parents do not give out their children any more as house helps. When, His Excellency, was the Minister of Education and Executive Governor of Ebonyi state, he prescribed some punishment for any parents who gave out their child for house help, especially the girl-child. In South Africa, a recent report by Human Rights Watch warns that sexual violence and abuse are hampering girls' access to education. In Afghanistan, they have simply been barred from school under the Taleban regime. According to Guttman (a UNESCO courier journalist), customs, poverty, fear and violence are the reasons why girls still account for 60% of the estimated 113 million out-of-school children, and majority live in sub-Saharan Africa and South Asia.

In Uganda, Birungi (2008) cited the rampant fire in schools as examples of the gaps in implementation of the girl-child education. She noted that the previous year's floods in eastern Uganda left many schools in disrepair and these were seen as forms of exclusion. Children in Bundibugyo district cannot access schools during the rainy seasons and the government has done nothing to alleviate the problem.

Most of the factors that militate against the girl-child access to education are socio-cultural. Many countries on the African continent rank among the poorest in the world. The on-going HIV/AIDS epidemics, over-crowding in cities, tribal warfare and corrupt governments have contributed to the degeneration of the beautiful African land into a human rights catastrophe. At the centre of the devastating situation is the girl-child. The girl-children appear to be the most vulnerable and most undervalued members of the world society. In a region where many are struggling to get enough food and to stay alive, remain out of reach of the various violent rebel armies, and to care for those stricken with various diseases, a basic education, especially for girl children, is low on the list of priorities.

The right to education, which is a fundamental human right, is frequently denied to girls in some African countries. The then United Nations Secretary General, Kofi Annan, stated that in Africa, when families have to make a choice, due to limited resources of educating either a girl or a boy child, it is always the boy that is chosen to attend school. In Africa, many girls are prevented from getting the education entitled to them because families often send their daughters out to work at a young age, so that they can get the additional income they may need to exist beyond subsistence level, and finance the education of sons.

It has been reported in BBC News (2006), that African patriarchal societal viewpoint favours boys over girls because boys maintain the family lineage. Additional reasons why girls do not have adequate access to education in Africa include the fact that many have to stay home to nurse relatives with HIV/AIDS. That their mothers were not educated is another reason that makes them feel that their daughters do not need education. Furthermore, some families do not believe in education of girls. In Ethiopia, child brides face early pregnancy, responsibilities to their children, in-laws and husbands, who are usually much older, to let them out of the house.

2.4 Kenyan Situation

There are three levels of educational institutions: primary, secondary and post secondary which includes institutions of higher education. The education system consists of eight years of primary education, four years secondary and four years post-secondary education (8-4-4) (Republic of Kenya, 2007). After 8 years of primary education, students sit for the Kenya Certificate of Primary Education which determines whether they continue on to secondary school or not. After four years of secondary school, students sit for the Kenya Certificate of Secondary Education, an exam that determines entry into higher education. This examination education system puts a lot of pressure on students, parents and teachers alike.

Students feel intense pressure from parents and teachers to do well in the national examination in order to gain admission into government-sponsored schools or universities (Tumuti, 1985; Kithyo and Petrina, 2002). The problem with this is that only about 35% of students are admitted to secondary schools and only 12% of secondary graduates gain admittance to universities (Republic of Kenya, 2005). It is therefore not surprising that students experience intense anxiety in the educational arena. Studies of Kenyan students at the primary, secondary and tertiary

institutions found that they reported feeling confused, anxious and fearful about the examination and career selection process (Tumuti, 1985).

Students who do well in Kenya Certificate of Primary Education attend government maintained or aided schools whereas the rest have to attend either private or "harambee" (unaided) schools. The budgets of the latter two are fully funded by tuition/fees from students, making them less desirable (Tumuti, 1985). Consequently there is intense pressure to perform well in the national examinations. In his study of fifth and seventh graders in rural, semi-urban and urban schools Tumuti (1985) found that 95% of students reported feeling pressured to pass the primary school examination, 77% reported fear of failing, 73% reported confusion/fear regarding making career choices and 64% reported they lacked career guidance/information regarding employment opportunities.

The Kenyan school system puts female students at a disadvantage in terms of access to quality education because female students' performance is worse than male students' in the major examinations (Agesa and Agesa, 2002).Results of several examination years reveal that girls are out performed by boys in mathematics, science and technical subjects at the Kenya Certificate of Secondary Education (KCSE). This renders them unable to attain equal parity with their male counterparts in joining the world of sciences at the university level. To illustrate this fact, the table below shows the performance of girls and boys in selected mathematics and science subjects in Kenya Certificate of Secondary Education in the year 2006 (Directorate of Quality Assurance Scheme, Ministry of Education).

Table 2.1: Mean score in selected subjects in 2006 KCSE examination by gender

	Females	**Males**	**Total**
Mathematics	15.78	21.87	19.01
Biology	25.00	29.84	27.44
Physics	39.07	40.82	40.31
Chemistry	22.56	27.01	24.91
Biology	26.16	24.48	24.99

There are several reasons suggested for this, including biased instruction methods, more domestic chores for girls and harassment in the school system (Kiluva-Ndunda, 2001). Examples of biased instruction include, the documented practice of teachers in mixed schools asking the male students to perform science experiments and the female students to record results and clean up afterwards as well as learning materials based on gender stereotyped roles (FAWE, 2007).

Poor examination performance in science subjects and mathematics limits girls' opportunities to pursue higher education because students' academic performance and career choices at the primary and secondary level have lifetime ramifications in terms of employment opportunities (Tumuti, 1985; Osoro et.al, 2000). Performance in Kenya Certificate of Primary Education determines which rank of secondary school a student will attend. This in turn affects their likelihood of attending universities and other tertiary institutions.

Gender disparities also exist in government funding of schools (Sifuna, 2006). These originated from colonial times and continue to affect current performance of students (Wambua, 2007). Female students are more likely attend non-funded schools compared to their male counterparts (Sifuna, 2006). These schools usually have fewer resources such as science laboratories, employ less qualified teachers and are limited in the scope of courses they offer, putting their students at a disadvantage when competing for university entry (Kiluva-Ndunda, 2001; Sifuna, 2006; Wambua, 2007). This further limits women's chances for pursuing higher education, particularly in the areas of science, mathematics and technology.

In higher education institutions gender disparities are also apparent. In 2005/2006 women comprised 36% of all 89,491students enrolled in both public and private universities (UNESCO, 2006). It is interesting to note that women constitute 34.5% of total enrolment in public universities and 53.3% in private universities (Agesa and Agesa, 2002). This may be due to the fact that the highest proportions of courses offered in public universities are science based whereas private universities almost exclusively offer Arts, Humanities and Social Sciences. Medical schools, Engineering and Science faculties are all found in the seven public universities. For example, Jomo Kenyatta University of Agriculture and Technology, a university that offers only science and engineering courses, has the lowest enrolment of female students at 20% whereas Kenyatta University has 40% female enrolment and has the largest faculty of education

(Agesa and Agesa, 2002). The number of women decreases further at the graduate level. In 1989/90 of the 227 students enrolled in graduate programmes in Kenyatta University, one of the large public universities, only 4.2% were women. One of the explanations is the underrepresentation of women among the top students (first class and upper second class honours) (Hughes and Mwiria, 1989). Academic performance is a top criterion in admission to graduate programmes.

The same trend is seen in tertiary institutions. Of the 18,116 students enrolled in national polytechnics in 2004/2005, only 35% were women and only 5% of them were enrolled in science/engineering programmes (Ministry of Education, 2005; UNESCO, 2006). The numbers are reversed in youth polytechnics, the lowest cadre of technical and vocational training institutions offering short term courses. In the same year 62% of students enrolled in these youth polytechnics were women.

University enrolment reveals significant differences in socioeconomic backgrounds of female and male students. Women from higher socioeconomic backgrounds have a higher likelihood to pursue higher education than women from farming/unskilled labour families (Lindsay, 1980). A study of 295 graduates from University of Nairobi showed that 64.2% of the female students came from middle and higher socioeconomic/income families compared to only 37.7% of male students (Hughes and Mwiria, 1989). One of the reasons for this economic disparity may be the cultural preference of educating boys as opposed to girls when faced with financial constraints – when finances are not a constraint parents will send their daughters to school (Hughes and Mwiria, 1989; Kiluva-Ndunda, 2001; Lindsay, 1980).

2.5 Factors That Influence Girls' Academic Performance

The high failure rate among girls in science subjects as compared to other subjects in Kenya is alarming. There seems to be some contributory factors that are leading to the failure rate. Hirst and Peters (1979) states that "liking is a frequent occasion for the development of personal relationships in that it predisposes people to enter into them. "Good environment is not being created for learners to have an interest in the subject. According to the research done by Goodland (1984), students expressed considerable liking of certain subjects than others. He also found out that teachers offering certain subjects appeared to

occupy positions of declining significance in the lives of the learners. The picture that emerges is of classrooms becoming routinized with respect to instructional practices. Leedy (1993) as quoted by Maumela (1995) states that "everywhere our knowledge is incomplete and problems are waiting to be solved. We address the void in our knowledge, and those unresolved problems, by asking questions and seeking answers to them. A person cannot develop a positive attitude towards something he or she does not like. "Interest is the sin qua non-for affection and appreciation" (Gill, 1995). A positive interest gives rise to a positive attitude towards something.

A good environment must be created for knowledge to be fostered on the part of the child. According to Vernon (1986) "an environment must be created which is stimulating enough for children to develop their abilities and satisfy their interests." He states further that "it is important that the child be happy in school, that his/her life develop from day to day with a feeling of achievement, that he/she consider himself/herself a person of work, that he/she feels that he/she is understood and appreciated, and that he/she has opportunities to express his/her creative and artistic abilities.

The lack of teaching media and subject apparatus e.g. laboratory facilities seem to be another factor that contributes towards the poor performance and passing rate of science subjects. This means that most of the teaching is based on theory (Ornstein, 1992). Sciences are practical subjects and some of the concepts need to be demonstrated practically. Certain aspects like displacement reactions, osmosis, transpiration in plants, exponential decay and half life and others need practical demonstrations or excursions so as to be observed. Theory and practice must go hand in hand and it will bridge the gap between theoretical and practical knowledge. Practical lessons enhance more understanding of the subject matter. Ornstein (1992) indicates that lack of practical lessons in a learning-teaching situation gives rise to a limited scientific basis of teaching. This could be the case with the sciences in Kenyan national examinations. True knowledge of teaching is achieved by practice and experience in the classroom. Eisner (1983) states that "if there is too much theoretical teaching on aspects that need practical demonstrations and fail to do those practicals, it becomes a problem. "Learners cannot apply in practice what they are taught in theory. Practical lessons are important.

"Scientific research provides humans with indisputable knowledge" (Kincheloe, 1991). Skills can only develop with practice.

Teachers teaching the subject are most probably unable to apply in practice what they teach in the classroom situation. This is due to the lack of knowledge and professionalism on the subject. There is no professional competence amongst them thus contributing to poor performance by the learners in the subjects. One could assume that teachers lack the skills of teaching the subject properly and professionally. Mastery of the subject matter to be taught is also one important aspect that is required for good teaching. Good skills in teaching are not important if the subject matter is not mastered by the teacher.

Holmes and group as quoted by Ornstein (1992) maintains that "pedagogical knowledge, and skills are as important than subject knowledge, and is best illustrated by the recent emphasis on cognitive psychology, with its focus on teaching methods, thinking skills, and student learning strategies." Teachers' skills and strategies are very important in educative teaching. True knowledge of teaching is achieved by practice and experience in the classroom. According to one researcher, "the knowledge that teachers came to have the most faith in and used most frequently to guide their teaching is consistent with traditions that have worked in the classroom area" (Ornstein, 1992). Teachers who lack good teaching skills cannot be expected to produce good results. If teachers have problems on the subject itself, it is worse on the part of the learners. "Understanding requires matching materials to the learners' abilities and prior knowledge. If students do not understand the materials, frustrations sets in, making learning more difficult"(Ornstein, 1992).

Educational planning, according to Bishop (1986) "must move increasingly into creation and testing out of new educational designs, involving fundamentally new systems of teaching and learning designed to achieve well defined performance specifications with great effectiveness. "The teaching skills of teachers teaching agricultural science must be well looked into if improvement on the subject is needed. Professional competence is therefore to be judged not only by the ability to articulate in the classroom and defined moral principles but also by the end of year results. According to Carr and Kemmis (1986),"teachers' knowledge and good teaching skills provide a starting point for critical reflection."

The availability and distribution of reference materials including textbooks in schools seems to be important. Lack of these materials could also contribute to the poor performance in science national examinations and possibly de-motivate the learners who are doing this subject.

Research done by Lepper and his colleagues as quoted by Eisner (1985) indicates that in a number of experiments that the use of extrinsic rewards create a set of expectations on the child's part. The research data further suggests that recognition and rewards for students' accomplishment are a proven way of raising children's self-esteem. Teachers are lacking positive expectations about their students' learning abilities in science. They are not providing honest rewards and praise. It is the teacher's role to assure that each learner can be successful at something. There are no rewards or prizes to female science learners and this dampen their future interests of pursuing with the subject.

Learners are expected to obtain knowledge with regard to the demands made by different occupational fields in order to succeed in them and this can only happen if they are given this knowledge by knowledgeable teachers in the subject they offer. Education must be goal directed and learner centred. Jacobs (l991) mentions that "occupational choice is the result of conservative decisions made during specific phases in one's life. "Learners are not obtaining knowledge in these subjects with regard to the demands made by occupational fields that are technologically oriented in order to succeed in them. They are not being helped to discover their talents in the field of science and this is hindering their occupational interests. Learners taking the sciences are not aware of what the subjects they are taking can bring to them. Educational and occupational information are not being provided and interpreted to learners in the field of science. Learners are not guided to explore the educational and occupational possibilities in the field of science hence knowing very little or none at all about vocations related to science. Learners are not being made aware to understand their own potential with a view of making an educational or occupational choice of their own which is related to sciences.

Jacobs (1991) states that "to study means to learn purposefully and deliberately. Studying is therefore always a purposeful activity. "Amongst the learners doing biology, chemistry or physics, studying of these subjects is not purposeful and deliberate since they are ill informed about career choices related to these subjects. The learners' strength on the subjects is not

good because there is nothing motivating which makes the learners to be interested in them. They just do the subjects with no career prospects attached to them. The strength of coping with the subject arises from the children's interests. Teachers are not directing the children's' interests to go beyond their immediate wastes. Subject preference contributes to the coping strength on the subject. This is most probably not the case with science learners on the subject. They most probably do not spend enough time studying science subjects like they do in other subjects and few or no practical lessons are being done on the sciences besides them being practical subjects by themselves. Educative tours or excursions that are science oriented are most probably not undertaken. This leaves the learners with very little information and knowledge of the sciences as compared to other subjects.

2.6 Girls' Performance in Mathematics and Sciences in Kenya Certificate of Secondary Education

The year 2000 Kenya Certificate of Secondary Education Examination results indicated a dismal performance for girls as compared to boys. Out of the 33 subjects offered in this examination, girls performed better than boys in only five subjects. These subjects were English, Kiswahili, Home Science, Music, Typewriting and Office Practice. Further to this, the same results indicated a comparatively poor performance for girls in mathematics and science subjects and under enrolment of girls in physics as shown in the Table 2.2.

Table 2.2: Performance in 2000 KCSE mathematics and science examinations by gender

	Enrolment		**Mean Performance**	
Subject	**Females**	**Males**	**Females**	**Males**
Mathematics	84,013	96, 967	13.42	18.67
Biology	49,757	59, 718	30.23	33.6
Physics	11,276	28, 516	29.48	32.74
Chemistry	50,442	64, 883	27.72	31.76
Physical Science	32,294	30, 847	18.27	21.23

Learners taking a science subject do not seem to be well prepared for the subject. They are taking the subject because it is one of the subjects in the curriculum, and / or it is within the mainstream of the subjects or they were told to do the subject by their teachers. The learners taking the subjects are not interested in the subject. The attitudes of teachers and other stakeholders towards the subject does not seem to be very positive, hence poor motivation which gives rise to bad performance in chemistry, biology and physics.

In Kenya the girl–child education is elusive. Mwangi, (2004) wrote that a combination of poverty, disease and backward cultural practices continued to deny the girl child her right to education. Even with the introduction of free primary education, access to education is still remaining a wide dream to many Kenyan children. Despite the introduction of free primary education in the country which accounted for an increase in enrolment, a sizeable number of children, especially girls, still find themselves out of school owing to a number of reasons. These reasons are: demands for their labour in the homes such as assisting in looking after their young siblings; child marriage, doing house chores, death of mother and looking after the sick member of the family.

Some of the girls are given to marriage against their wish and when they refuse, they are threatened with death. The children are married off at a tender age in quest of dowry from the husbands. The girls lament that because of the setbacks, they still did not escape from poverty and their parents had nothing to show for the dowry received. Some parents justify the denial of girls of their right to education to prevent them from bringing shame to the family through early pregnancy. Yet others believe that women who are at the same level of education as the men are a disgrace to the community because more often than not, they will not get married and if they do, it will be to a foreigner. For such parents, early marriage is the best way to prevent this and at the same time preserve traditions.

2.7 Boys' Performance in Mathematics and Sciences in Kenya Certificate of Secondary Education

Boys perform better than girls in all Kenya Certificate of Primary Education subjects as well as in all Science courses at the Kenya Certificate of Secondary Education level. Available data reveals that boys generally perform better than girls in the Kenya Certificate of Primary

Education. In the year 2006 for example an analysis of the mean score by gender posted the following picture:

Gender	Mean Score
Females	240.43
Males	253.9
Total	249.80

Table 2.3 shows the mean performance of Primary 4-6 pupils in four (4) core subjects. Boys have higher mean scores in mathematics and social studies while girls presented higher mean scores in English and primary science. The achievement of the two groups is poor from the mean scores. The implication is that the foundation is weak as the primary level of education is the foundation for higher education. If Nigeria and indeed African countries are to achieve the Education for All goals, particular attention must be paid to the primary school level.

Table 2.3: Mean performance of pupils in core subjects

	Maths		**English**		**Social Studies**		**Primary Science**	
Primary	M	F	M	F	M	F	M	F
4	36.72	37.22	26.05	24.87	25.26	25.27	40.36	40.41
5	47.06	37.77	25.02	25.74	26.93	26.20	38.13	47.98
6	35.65	35.57	20.38	20.98	21.21	19.75	39.78	41.14
Total	**39.81**	**36.85**	**23.82**	**23.86**	**24.47**	**23.74**	**39.42**	**43.18**

Table 2.4 presents a summary of achievement at the primary school level in four (4) core subjects, namely: Mathematics, English, Social Studies and Primary Science in 37 States of Nigeria. The evidence as shown is that boys performed higher than girls in English and Primary Science, while girls performed better than boys in Mathematics and Social Studies. In both cases, the mean sores are higher than the national mean score.

Table2.4: Higher Scorer in Core Subjects

Subjects	Males	Females
Mathematics	Scored higher in 14 states	Highest scorer **M=44.58.**
English	Highest scorer **M=28.88**	Scored higher in 19 states
Social Studies	Scored higher in 14 states	Highest scorer **M=29.88.**
Primary Science	Highest scorer **M=46.88**	Scored higher in 25 states

It is interesting to observe that the girl-child does well in school when given the opportunity. Females scored higher than the males in 25 states in Primary Science and had the highest score in Mathematics. Females also scored higher than males in 19 states in Social Studies. Generally, performance at the primary school as shown by the national mean score is poor. This can be attributed to the quality of education offered at that level. Some of the factors that influence quality education include: teacher quality, availability of facilities, instructional resources, infrastructure, supervision of instruction, provision of school meals, hands-on and learner centred methods and approaches, parental involvement and learner-friendly environment.

2.8 Challenges Facing Girls in Achieving Their Potential in Science Subjects

The right to education, which is a fundamental human right, is frequently denied to girls in some Africa countries. The then United Nations Secretary General, Kofi Annan, stated that in Africa, when families have to make a choice, due to limited resources, of educating either a girl or a boy child, it is always the boy that is chosen to attend school. Many girls are prevented from getting the education entitled to them because families often send their daughters out to work at a young age, so that they can get the additional income they may need to exist beyond subsistence level, and finance the education of sons.

Some of the challenges that girls face that put them at a disadvantage to achieve their potential in science subjects in the Kenya Certificate of Secondary Education include the direct and indirect costs of education which can be high, traditional attitude and practice which can work against a girl's right to education, the legal framework which is often weak and disadvantages girls in particular, the irrelevance of schooling. Children are more likely to drop out of school if it is irrelevant to their realities and issues of safety and security in and around school particularly affect girls. The education system itself can be a considerable barrier to education.

Most of the factors that militate against the girl-child access to education are socio-cultural. Many countries on the African continent rank among the poorest in the world. The on-going HIV/AIDS epidemics, over-crowding in cities, tribal warfare and corrupt governments have contributed to the degeneration of the beautiful African land into a human rights catastrophe. At the centre of the devastating situation is the girl-child. The girl-children appear to be the most vulnerable and most undervalued members of the world society. In a region where many are struggling to get enough food and to stay alive, remain out of reach of the various violent rebel armies, and to care for those stricken with various diseases, a basic education, especially for girl children, is low on the list of priorities.

2.9 Strategies for Improvement of Girl Education

Strategies are needed to address quantity, enrolment and retention of girls in education systems and quality, substantive content, teaching processes, the learning environment, and other aspects of quality, all of which are measured through learning achievement of girls.

2.9.1 Retention/dropout rates of girls

Policies to improve school progression and reduce the numbers of children dropping out of school are critical if Universal Primary Education (UPE) is to be achieved. Children are starting primary school in greater numbers than ever before but dropout rates are significant and lead to low levels of primary school completion in many countries. In Benin, for example, the primary school completion rate in 2005 was 62 percent, although it increased steadily from 38 percent in 2000. In the Democratic Republic of Congo, the primary school completion rate in 2007 was 51 percent, which was the same completion rate for the country in the early 1990s (UNESCO).

UNICEF (2003) reported that in Sub-Saharan Africa, the number of girls who drop out of school each year has risen from 20 million in 1990 to 24 million in 2002. Of the 25 selected countries studied, fifteen (15) were in sub-Saharan Africa. The criteria studied were: low enrolment rates for girls; gender gaps of more than 10 percent in primary education; countries with more than one million girls out of school; countries included on the World Bank's Education For All Fast Track Initiative and countries hard hit by a range of crises that affect school opportunities for girls, such as HIV/AIDS and conflict. The fifteen countries included Chad, Nigeria, Sudan, Tanzania, Eritrea, Ethiopia and the Democratic Republic of Congo. The worst hit is Southern Sudan, which has been seriously affected by civil war for decades. UNICEF said to wait for an end to the conflict would be to dismiss the rights of generations of children. UNICEF noted that in the area, as few as 15 percent of primary school-aged children were in school and girls represented only one quarter of the number. By the time the upper primary level was reached, there were hardly any girls left in school and at the territory's foremost secondary school, Rumbek, there was a solitary girl. Only 560 of the 8,000 teachers in southern Sudan are women, which was merely seven percent (Nduru, 2003).

As a result of substantial rates of drop out and non-completion of primary school many children are leaving school without acquiring the most basic skills. Their brief schooling experience consists frequently of limited learning opportunities in overcrowded classrooms with insufficient learning materials and under-qualified teachers (Alexander, 2008). Children of different ages and abilities are mixed together in single classrooms without proper adaptation of teaching methods to improve learning and to induce school engagement (Little, 2008(UNESCO). Such schooling circumstances, together with personal and family level factors such as ill-health, malnutrition and poverty, jeopardize meaningful access to education for many children. As a result, many children are registered in schools but fail to attend, participate but fail to learn, are enrolled for several years but fail to progress and drop out from school.

Failure to complete a basic cycle of primary school not only limits future opportunities for children but also represents a significant drain on the limited resources that countries have for the provision of primary education. According to the World Bank, the Government of Malawi for example allocated 4.2 percent of Gross Domestic Product towards public educational expenditure in 2007, which represented around 195 million dollars. Of this, 55 percent was

allocated towards primary school. With a primary school dropout rate of 65 percent in 2007, it is estimated that nearly half a million school places were taken up by children who fail to complete primary school. In monetary terms, this broadly represented an annual expenditure of 60 million dollars, 1.3 percent of GDP in 2007, on the education of children who probably left schooling without any basic skills.

Despite its importance, strategies designed to improve primary school retention and progression has received relatively little attention. Typically, national education plans assume that primary school progression will improve automatically as a result of interventions designed to improve initial access and educational quality. Nevertheless, improving progression in primary school may not necessarily be about improving the quality of education alone. For instance, data from the Southern and Eastern Africa Consortium for Monitoring Educational Quality (SACMEQ) show very high variation between mathematics test scores (a crude indicator of educational quality) and survival rates to Standard 5 (mainly determined by the cumulative dropout rates). Namibia has very low average achievement in mathematics but a survival rate to Standard 5 around 87 percent. At the other extreme, Mozambique has relatively high average achievement in mathematics test scores but survival rate to Grade 5 is just above 40 percent (UNESCO,2008).

In rural areas, social and cultural patterns combined with relatively poor quality of schooling place girls, their education and development in a disadvantaged and vulnerable position. Girls bear the heaviest burden for household responsibilities, including care of sick parents and siblings, and are first ones to drop out of school. In South Eastern Nigeria, more boys than girls drop out of school shown in Tables 2.5, 2.6, and 2.7 (UBEC, 2003). The drop-out syndrome is a function of some factors that distract the boys from schools. These factors include: preference for a trade, quest for money, parental decision, lack of employment opportunities, hawking/street trading, and long process of education and lack of counselling.

Table 2.5:Pre-Primary school enrolment in South East Nigeria in 2003

State	Male Enrolment	Percentage	Female Enrolment	Percentage
Abia	24,775	50.62	24,165	49.35
Anambra	137,390	51.20	35,640	48.80
Ebonyi	5,811	33.79	10,936	66.21
Enugu	7,403	50.46	17,083	49.54
Imo	32,182	49.80	32,432	50.20

Table 2.6: Primary school enrolment in South East Nigeria in 2003

State	Male Enrolment	Percentage	Female Enrolment	Percentage
Abia	138,165	49.80	139,278	50.20
Anambra	174,243	45.31	139,278	54.69
Ebonyi	205,615	49.42	210,325	50.58
Enugu	350,052	49.62	355,369	50.38
Imo	242,267	51.22	230,771	48.78

Table 2.7: Secondary school enrolment in South East Nigeria in 2003

State	Male Enrolment	Percentage	Female Enrolment	Percentage
Abia	63,824	44.79	78,684	55.21
Anambra	74,690	42.88	99,499	57.12
Ebonyi	89,636	49.78	90,427	50.22
Enugu	83,311	43.36	108,835	56.64
Imo	89,923	46.41	103,835	53.59

2.9.2 Equity

The enrolment trend from pre-primary to secondary schools in Nigeria is examined in order to see the extent of equity or parity between male and female learners (the boy-child and girl-child). The data covers all the thirty-six (36) states of Nigeria and the Federal Capital Territory, Abuja. Tables 2.8 and 2.9 show gender disparity from pre-primary to secondary school levels. The enrolment percentages of the boy-child are consistently higher than that of the girl-child. These differences are significant. Despite government programmes for children's education, there are still gaps in the enrolment of the boy-child and the girl-child education in Nigeria.

Table 2.8: Enrolment by gender from pre-primary to secondary school in 2004

	Pre-Primary	**Percentage**	**Primary**	**Percentage**	**Secondary**	**Percentage**
Male	937, 997	51.13	12, 273,046	55.12	1, 567, 011	56.54
Female	896,522	48.87	9, 994361	44.88	1, 204, 623	43.46
Total	**1, 834, 519**	**100.00**	**22,267, 407**	**100.00**	**2, 773, 418**	**100.00**

Table 2.9: Enrolment by gender from pre-primary to secondary school in 2005

	Pre-Primary	**Percentage**	**Primary**	**Percentage**	**Secondary**	**Percentage**
Male	956, 475	51.42	12, 273, 046	55.12	1, 559, 038	56.21
Female	903, 796	48.58	9, 994, 361	44.88	1, 214, 380	43.79
Total	**1,860,271**	**100.00**	**22,267,407**	**100.00**	**2, 773, 418**	**100.00**

The FME (2006) found out that in the south, a moderate bias towards boys' enrolment is evident in the south west, while the south east displays a bias towards girls' enrolment. In the north there is a strong evidence of bias towards boys' enrolment. Offorma, (2008) confirmed that disparity is more in the northern part of the country in favour of the boy-child than in the southern part. In south- eastern states there are more girls than boys in the secondary schools, but more boys than girls in the pre-primary, except for Ebonyi and Imo state. In South Africa, the enrolment of girls

in schools has increased to 53% in secondary school. The intake and access to primary school has attained 100%. This implies that the girl-child at that level of education equal access to school as the boy-child.

2.9.3 Quality

The Jomtien Conference of 1990 launched the Education for All initiatives, which aimed at getting children into school within ten years and also stressed that the urgent priority was to ensure access to and improve the quality of education for girls and women. Many countries mapped out programmes to facilitate the implementation of the initiatives. Nigeria embarked on Universal Basic Education. All these are in a bid to meet Millennium Development Goal number two, which is to achieve Universal Basic Education.

The question is what is the quality of education given to the girl-child that will help her to adapt to the knowledge based economy of the 21st century? The answer to this question can be attempted by looking into what happens in the schools today. Demotivated teachers, examination malpractice, gender biased curriculum, lack of school facilities and instructional materials, incessant strike actions are some of the variables in the quality of education of children.

UNICEF education chief in South Africa, Wamahiu (2008) said quality education was not about how well a child was performing in school but a number of factors that enrich the well being of a child in school. She cited the issues of administration of discipline, corporal punishment, sexual harassment, child abuse and child labour as some of the things that lead to exclusion of groups of students from accessing quality education. United Nation statistics, national reports and studies initiated by non-governmental organizations in 2005 repeatedly showed that girls, as a group, had lower literacy rates, receive less health care, and more impoverished than boys. Today we are in a revolution and this will be reflected in teaching, research and community work, which will help the girl-child to fit into the global society.

2.9.4 Retraining teachers

Teaching is one of the most delightful and exciting of all human activities when it is done well but is one of the most humiliating and tedious when it is done poorly. For instance, retraining of teachers should be considered. The teacher is a prime factor in the performance of students. In a

study carried out by Wanjohi and Yara (2011) teachers' qualification was found to be significant and could also used to predict students' performance in mathematics. This is in agreement with the findings of Kaur (2004) who opined that in Singapore the problem of teaching mathematics and sciences needed qualified teachers/educators and recommended that the Ministry of Education (MoE) equip mathematics teachers with the necessary skills through in-service courses.

2.10Solutions to the Girl-Child Education Issues

Since liberation from the Apartheid, South Africa has changed their curriculum to be responsive to the demands of the nation. Their curriculum is child-centred, no more the talk and chalk approach. This idea could be borrowed by the African countries. In Kenya, all hope is not lost. The government has taken some initiatives in the promotion of children's education by enshrining this right in the Children's Act, 2001. The Act also created a department for children to deal with their rights and welfare. Application of such laws as, imprisonment of any person found guilty of negligence in this case, knowingly and wilfully causing a child to become in need of care and protection has helped towards the promotion of the children's right to education.

According to Section 127 of the Children's Act 2001, "any person found guilty of negligence is liable for a maximum of five years' imprisonment or a fine of a sum not exceeding KES 200,000 or both". Other countries can promulgate such laws so as to improve access to education of the girl-child. Of significance also is the fact that a number of NGOs have been allowed to operate in areas where early marriage is prevalent. They are now educating the people on the importance of taking girls to school rather than marrying them off to older men. The government, in collaboration with NGOs has also established centres where girls rescued from early marriage are accommodated and counselled, before being sent back to school. Through strict intervention of the government there is hope for the children who have been out of school to pursue their lifelong dreams.

Braun et al (2004) observed that feeding children in school has paid significant educational dividends. A school feeding programme in Bangladesh, for instance, has resulted in a 35% overall increase in enrolment and a remarkable increase 44% increase for girls. It is

recommended that governments should emulate Bangladesh so as to achieve the Millennium Development Goal number two, which is attaining Universal Basic Education.

Schools in Africa are often substandard, especially in rural and isolated areas. This means that even the few girls lucky enough to get access to an education often receive one of poor quality and limited duration. Many schools in Africa are nearly destitute, with classes being held in crowded, poorly constructed structures, in which there is very limited access to stationery and even less access to text books and computers. Although much has been done to improve girls' education in African countries, there is still much that needs to be done. The largest hurdle that needs to be overcome before all African girls can all get the education they deserve is the prevailing social thought that discourages or minimizes the importance of education for girls. To stop this, countries in Africa need to pass laws banning the early marriage practices that keep girls out of school. Finally, African governments must pass legislation that makes the education of girls mandatory for primary school, and then enforce these laws stringently in the rural communities.

Most countries of Africa are multi-cultural, multi-linguistic and multi-religious. The diversity and value system must be the focus of education to ensure that quality education is given to the children. Education is the right of every girl everywhere and key to transforming her life and the life of her community. Without education, girls are denied the opportunity to develop their full potential and to play a productive and equal role in their families, their societies, their country and their world.

2.11 Conceptual Framework

This study looks at the girls' performance in mathematics and science subjects in the Kenya Certificate of Secondary Education (KCSE) in public secondary schools and factors that influence the performance. It highlights the girls' and boys' performance in mathematics and science subjects, challenges facing girls in sciences and the strategies for improvement. The category of school, government education policy and cultural perception are believed to have a significant contributory effect on the performance of girls are also highlighted. These have been summarized in conceptual framework as shown in Figure 1.

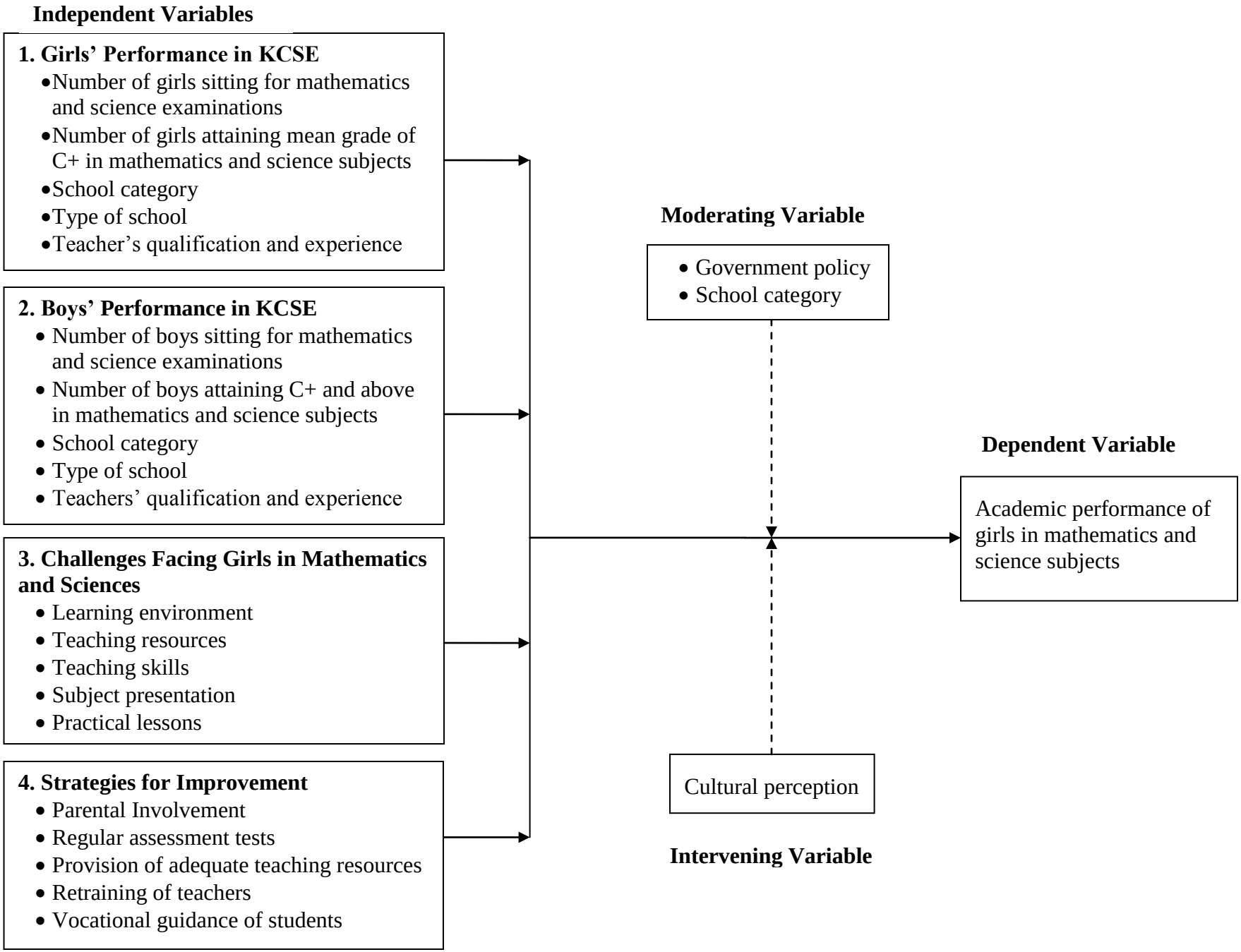

Figure 1: Conceptual Framework

2.12 Knowledge Gap

The number of previous studies in this area indicates that it is an area worthy of doing research. There is limited information on girls' performance in science subjects in public secondary schools in Westlands District, Nairobi County. The literature review highlighted several factors that contribute to poor performance as researched by different researchers internationally and in Kenya. Westlands is one of the Districts in Nairobi County where most female learners are unable to perform at a level that would allow them a science related career option. The impact of these factors on the academic performance of learners is applicable to all learners; especially those who are from poor socio-economic backgrounds, irrespective whether the country is classified a developed or developing country. Similarly, this is a global problem as highlighted by international and local literature.

2.13 Summary of Chapter Two

This chapter has examined other scholarly and literature works from different renowned and distinguished scholars and authors on girls' performances in mathematics and science subjects. The initial stages highlight the global, regional and local perspectives on girls' education status followed by a detailed discussion on factors that influence girls' academic performance, challenges facing in girls in the pursuit of education, strategies to improve girls' performances and the solutions to the girl-child education issues. The conceptual framework which is a diagrammatic representation of all the identified variables and how the interact and link with each other is also given. The final section of this chapter highlights the knowledge gaps that have been identified and what the study will be aiming to fill.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter outlines the research methodology that was used in the study. It is discussed under the following sub-topics; research design, target population, sampling procedure, methods of data collection, reliability and validity of data collection instruments, methods of data analysis, ethical considerations, and operationalization of variables.

3.2 Research Design

The study employed a descriptive survey research design based on a cross sectional descriptive research design. The cross-sectional survey research, as argued by Best and Kahn (1986), information is collected from random a sample which is been drawn from the target population and the sample represents the target population. The design helps in collecting data on the current status of the situation without manipulating the environment. Both quantitative and qualitative research strategies were employed in the data collection process.

3.3 Target Population

The target population for this study consisted of ten Head-teachers from the ten public secondary schools, forty mathematics and science subject teachers and form three students of all the ten public secondary schools in Westlands District. Westlands is located 3.1 kilometres by road, northwest of the central business district of Nairobi County. There are ten public secondary schools in Westlands District. The ten public secondary schools had a total population of 1526 form three students.

3.4 Sampling Procedure

Sampling is a procedure where a fraction of the data is taken from a large set of data, and the inference drawn from the sample is extended to the whole group. According to Mugenda and Mugenda (1999) suggest that a sample size of 10-15% is enough for a survey. This study used 15% of form three students, 4 science teachers and the head-teacher to make the sample size of

the study. The calculation of the sample size is follows. The ten public secondary schools had a total population of 1526 form three students. A total of 230 students took part in this study. In addition 4 teachers for Mathematics, Biology, Chemistry and Physics in each school and the principal of the school formed the sample. Therefore the sample size was280.The sampling units were obtained through simple random sampling technique where each sample unit had an equal and independent chance of being selected.

3.5 Methods of Data Collection

Self-administered questionnaires, key informant guides, focus group discussion guides and document analysis were used to collect information from the respondents for this study. The three categories of questionnaires were used i.e. Student Questionnaires, Teacher Questionnaires and Head teacher Questionnaires. This approach was seen as ideal, because the aim was to capture in-depth views of both the educators and their learners. Such views would hopefully put into perspective, the context in which the teaching and learning of mathematics and physical science takesplace. Also, the views would provide an empirical basis of what could be done to counter the contributory factors to poor performance in these subjects.

3.6 Validity of Instruments

Ogula (1998) stated that validity is the extent to which a research instrument measures what it is designed to measure. In this exercise, the instrument together with the research questions were submitted to an expert in educational research in order to assess the content and construct validity so as to minimise occurrence of prejudice and obtain useful data. The interview instruments were judged according to positivist criteria of credibility, transferability, dependability and conformability. The data was interrogated, strengthened and supported using a similar criteria for credibility; triangulation, through the use of different data sources and various methods of data collection to confirm similarities and differences in data; peer debriefing, through discussion of the findings between principal researchers; study members checks, by checking observations and inferences with respondents' confirmation and correction of data; and negative case analysis, through including counter examples, alternative views and dominant positions.

3.7 Reliability of Instruments

Reliability of the instruments was obtained by using the test re-test reliability. Fraenkel and Wallen (1996) argue that for most educational research, stability of scores over a period of two months is usually viewed as sufficient evidence of test - retest reliability. Therefore, the researcher pre-tested and retested the instruments on a small number of participants in an interval of two months. The researcher computed the reliability for multi-opinion questions using Statistical Package for Social Sciences software.

3.8 Methods of Data Analysis

Qualitative data collected during the key informant's interview was transcribed or translated depending on the language used to conduct the interview and typed into Ms Word. The quantitative data was coded manually before the data entry process. All the data collected was entered into Statistical Package for Social Sciences and analyzed using descriptive statistics. Exploratory data analysis was conducted in order to uncover the structure of the data or any unusual value entered. Analysis began by tabulating the respondent's background characteristics by frequencies and percentages. Bivariate analysis was then conducted in order to investigate association between the dependent and independent variables. The correlation tests were used to test for the associations and strength of association between the variables respectively.

3.9 Ethical Considerations

Prior to embarking on the study, the researcher sought written permission from the concerned authorities. The questionnaire was approved by the supervisor before being used in the research. The participants were informed of the purpose of study and assured of confidentiality. No names were required on the questionnaire and participation was voluntary.

3.10 Operationalization of Variables

A variable is an empirical property that can take two or more values. It is any property that can change, either in quantity or quality.

A dependent variable is a variable whose outcome depends on the manipulation of the independent variables. In this study the dependent variable was improved academic performance of girls in mathematics and science subjects. Independent variable on the other hand is a variable that is manipulated to cause changes in the dependent variable. In this study the independent variables girls' performance in KCSE, boys' performance in KCSE, challenges facing girls in sciences and strategies for improvement. Moderating variables behaves like the independent variable in that it has a significant contributory or contingent effect on the relationship between the dependent and the independent variable. In this study the moderating variable were government policy and school category. Intervening variable is a variable that might affect the relationship of the dependent and independent variables but it is difficult to measure or to see the nature of their influence. In this study the intervening variable was cultural perception.

An operational definition describes how the variables are measured and defined within the study. It is a description of a variable, term or object in terms of the specific process or set of validation tests used to determine its presence and quantity. It is generally designed to model a conceptual definition. Table 3.1 is a summary of the operational definition of variables in the study showing the indicators, measure of indicators, measurement scale, tools and type of analysis. This will act as a guide to the researcher during the study.

Table 3.1: Operationalization of variables

RESEARCH OBJECTIVE	TYPE OF VARIABLE Independent	INDICATORS	MEASURES OF INDICATORS	DATA COLLECTION METHOD	LEVEL OF SCALE	TYPE OF ANALYSIS	TOOLS OF ANALYSIS
Girls Performance in mathematics and science subjects in K.C.S.E in Westlands District	Girls' performance in K.C.S.E	• Girls preference for sciences • Performance of girls in mathematics and science subjects	• Number of girls sitting for mathematics and science examinations • Number of girls attaining mean grade of C+ and above.	Records	Nominal	Descriptive Statistics	Mean, Percentages
Boys Performance in mathematics and science subjects in K.C.S.E in Westlands District	Boys' performance in K.C.S.E	• Boys preference for and sciences • Performance of boys in mathematics and sciences	• Number of boys sitting for mathematics and science examinations • Number of boys attaining mean grade of C+ and above.	Records	Nominal	Descriptive Statistics	Mean, Percentages
Challenges facing girls in mathematics and science subjects in KCSE in Westlands District	Challenges in learning mathematics and science subjects	• Learning environment • Teaching resources • Teaching skills • Subject presentation • Practical lessons	• Availability of conducive learning environment • Availability of adequate teaching resources • Availability of qualified teachers	Questionnaires Observation	Nominal	Descriptive Statistics	Mean, Percentages

			• Appropriate subject presentation techniques • Availability of equipped laboratories				
Strategies used to improve girls' performance in mathematics and science subjects in KCSE in Westlands District	Strategies for improvement of girls' performance in KCSE	• Teaching resources • Regular CATs • Retraining of teachers • Parental involvement • Vocational guidance of students	• Improved school facilities and environment • Number of test per term • Refresher courses and seminars • Parental guidance and support • Academic clinics and career talks workshops	Questionnaires Observation	Nominal	Descriptive Statistics	Mean, Percentages
	Dependent Academic performance of girls in mathematics and science subjects in Westlands District	Number of girls attaining C+ and means in mathematics and science subjects in KCSE in Westlands District, Nairobi County.		Questionnaires	Ratio	Descriptive statistics	Means, percentages

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND INTERPRETATION

4.1 Introduction

This chapter covers data analysis, presentation and interpretation of research findings obtained from the participants from the selected schools in Westlands District in Nairobi County. The study focused on assessing the performance of the girls in mathematics and science subjects in secondary schools, challenges facings girls in the pursuit of education and the strategies to improve girls' performance in mathematics and science subjects in KCSE.

4.2 Response Rate

This study was conducted in ten secondary schools in Westlands District. A total of 280 questionnaires were administered randomly to selected students, science teachers and all the head-teachers in the ten schools. Out of these, 218 were successfully collected indicating a 77.9% response rate. The response rate per school is shown in Table 4.1.

Table 4.1: Questionnaires return rate

S/No.	School	Questionnaires Issued	Questionnaires Returned	Percentage
1	Nairobi School	49	38	77.6
2	St. Georges Girls	43	32	74.4
3	State House Girls	40	36	90.0
4	Kenya High	35	30	85.7
5	Kangemi High School	31	23	74.2
6	Hospital Hill High School	19	15	78.9
7	Parklands Arya Girls	19	10	52.6
8	Lavington High School	19	14	73.7
9	Nairobi Milimani Secondary	15	10	66.7
10	Highridge Secondary School	10	10	100
	Total	**280**	**218**	**77.9**

4.3 Descriptive Characteristics of the Respondents

The general characteristic of the students who participated in the study is cross-tabulated in Table 4.2.

Table 4.2: General characteristics of the students' respondents

Age of respondents in years	Gender of the respondents (%)		
	Male	**Female**	**Total**
13-14	1.8	2.4	4.2
15-16	22.0	38.7	60.7
17-18	13.7	18.5	32.1
Above 18	2.4	0.6	3.0
Total	**39.9**	**60.1**	**100.0**

The female population was higher among the students' respondents accounting for 60.1% of the total students' respondents in comparison to 39.9% of the male students. 60.7% of the students were aged between 15 and 16 years and only 3.0% were above 18 years.

The general characteristic of the teachers who participated in this study is as shown in Table 4.3.

Table 4.3: General characteristics of the teachers' respondents

		Gender of the respondents		Level of education		Years of teaching					
Age (Years)		**Male**	**Female**	**Bachelor's Degree**	**Master's Degree**	**1-5**	**6-10**	**11-15**	**16-20**	**Above 20**	**Total**
20-30	Count	3	0	3	0	3	0	0	0	0	**3**
	% of Total	7.5	0	7.5	0	7.5	0	0	0	0	**7.5**
31-40	Count	8	6	13	1	0	8	6	0	0	**14**
	% of Total	20.0	15.0	32.5	2.5	0	20.0	15.0	0	0	**35.0**
41-50	Count	12	6	14	4	0	0	6	12	0	**18**
	% of Total	30.0	15.0	35.0	10.0	0	0	15.0	30.0	0	**45.0**
51-60	Count	2	3	2	3	0	0	0	0	5	**5**
	% of Total	5.0	7.5	5.0	7.5	0	0	0	0	12.5	**12.5**
Total	**Count**	**25**	**15**	**32**	**8**	**3**	**8**	**12**	**12**	**5**	**40**
	% of Total	**62.5**	**37.5**	**80.0**	**20.0**	**7.5**	**20.0**	**30.0**	**30.0**	**12.5**	**100.0**

The male teachers' participants were dominant at 62.5% and 37.5% were female, showing that science has been a male dominated field. 20.0% had a master's degree while 80.0% had first degree education. 72.5% of the teachers had over 10 years of experience in teaching.

The general characteristic of the head-teachers who participated in this study is as shown in Table 4.4.

Table 4.4: General characteristics of the head-teachers' respondents

		Gender of the respondents		**Level of education**		**Duration as a head-teacher**				
Age (years)		**Male**	**Female**	**Bachelor's Degree**	**Master's Degree**	**1-5**	**6-10**	**11-15**	**16-20**	**Total**
41-50	Count	2	0	2	0	1	1	0	0	**2**
	% of Total	20.0	0	20.0	0	10.0	10.0	0	0	**20.0**
51-60	Count	4	3	4	3	0	2	5	0	**7**
	% of Total	40.0	30.0	40.0	30.0	0.0	20.0	50.0	0	**70.0**
Above 60	Count	0	1	0	1	0	0	0	1	**1**
	% of Total	0	10.0	0	10.0	0	0	0	10.0	**10.0**
Total	**Count**	**6**	**4**	**6**	**4**	**1**	**3**	**5**	**1**	**10**
	% of Total	**60.0**	**40.0**	**60.0**	**40.0**	**10.0**	**30.0**	**50.0**	**10.0**	**100.0**

60.0% of the head-teachers who participated in this study were male as compared to 40.0% of their female colleagues. 70.0% were above 50 years of age. 40.0% had master's degree while 60.0% had first degree only 60.0% of those who participated had over ten years of experience as head-teachers.

4.4 KCSE Performances for Girls and Boys in Mathematics and Sciences

The KCSE performance was investigated by analysing the 2011 KCSE results. The performance of boys in mathematics and science subjects was far much better as compared to the girls' performance. This is evident in the 2011 KCSE national exam. For example in mathematics 83.0% of the students who sat for KCSE in 2011 at Nairobi School (a boys' school) scored a C+ and above while only 70.8% scored a C+ and above at St. Georges Girls Secondary School. At Hospital Hill High School, which is a mixed school, out of the 31 students who scored C+ and above in mathematics, 20 were boys with only 11 girls scoring a similar grade. The mean for boys in mathematics was 4.7619 while that of girls was 4.0950. At Lavington Mixed Secondary School, the mean for boys in mathematics was 2.1111 while the mean of girls was 1.6765. This is summarised in Appendix 5.

In biology, 75 students from Nairobi School scored the maximum score of an A as compared to 52 students from Kenya High. The two schools are in the national schools category. However, girls' appeared to prefer biology as compared to boys. All the students at State House Girls were taking biology while only 74.7% of the form four students at Kangemi High School, a boys' school, were taking biology. In overall, 93.13% of the students taking biology at Kenya High scored a C+ and above marginally higher than the 92.1% at Nairobi School, both national schools. But in overall the mean for biology at Nairobi School was 10.1084 compared to 10.0099 at Kenya High. Also at Highridge Mixed Secondary School the mean for boys in biology was 2.7333 while that of girls in the same school was 2.6364. This is summarized in Appendix 6.

Physics seemed to attract more boys than girls in the schools investigated. For example at Lavington Mixed Secondary School only 3 girls were taking physics compared to 18 boys in the same class. Similarly, 71.3% of the form four students were taking physics at Nairobi School, compared to only 53.4% of the candidates at Kenya High, both national schools. Even in performance the boys were far much better. For example in Hospital Hill Mixed High 5 boys

scored gradeB and above in physics compared to only 1 girl in the same class. Only 32.7% of all the candidates at State House Girls were taking physics and 40.3% of those scored a B and above. At Hospital High Mixed High School, boys had a mean of 6.7143 in physics while girls had a mean of 5.2083. Also at Lavington Mixed Secondary School, boys had a mean of 4.1667 in physics while girls had a mean of 3.3333. The summary of performance in physics is as shown in Appendix 7.

Chemistry is a compulsory subject in all the secondary schools in Kenya. Again boys outshined the girls in this subject. For example, at Lavington Mixed High School, 4 boys managed to score C+ and above in chemistry with no girl managinga similar score. The mean for boys was 2.9259 while that of girls was 2.5882. At Hospital High Mixed High School, 13 male candidates scored a B and above in chemistry compared to only 7 female candidates in the same class. The mean for boys was 6.0667 while that of girls was 5.6400. Also at Highridge Mixed Secondary School, the mean of boys was 2.2000 while that of girls was 1.7273. This has been summarised in Appendix 8.

The aggregate performance in the 2011 KCSE showed that boys outshined the girls. Boys scored very high marks guaranteeing them a position in the major public universities and enrolment to the science oriented prestigious courses like medicine and engineering. There were a total of 630 boys and 909 girls from Westlands District in the 2011 KCSE national examinations. 5.4% of the boys who sat for the 2011 KCSE examination from Westlands District scored a mean grade of an A, compared to 5.1% of the girls. 16.2% of the boys scored a mean grade of A- compared to 11.3% of the girls who scored a similar grade. It was noted that the majority the boys who scored an A and A- were from Nairobi School, a national school. Only one boy from Hospital Hill High School and another from Nairobi Milimani scored a mean grade of an A-. At Lavington Mixed High School, boys had an overall mean of 4.2037 while girls had an overall mean of 3.9412. Also at Highridge Mixed Secondary School, boys had an overall mean of 3.7333 while girls in the same class had an overall mean of 2.8182. This has been summarized in Appendix 9.

The Joint Admission Board (JAB) is the body mandated by the Ministry of Educated to admit students in public university. In the 2011 candidates, boys who scored a mean grade of B-plain of 64 points and girls who scored a mean grade of B-plain of 61 points were being admitted in the public universities. According to the Westlands District statistics, 36.5% of the boys and

43.3% of the girls who sat for KCSE that year were admitted to public universities. This is summarised in Appendix 10. Despite more girls being admitted to the university, it was noted that they were not enrolled in science oriented courses due to the relatively low performance in science subjects. They could only be enrolled in arts based courses.

4.5 Challenges Facing Girls in Mathematics and Sciences

The challenges facing girls in mathematics and sciences was measured using both closed and open ended questions and also observation. In open-ended questions the respondents were given room to explain their answers in detail. In the closed questions, the participants used Yes and No structure as well as a five-point Likert scale (i.e. 5= Strongly Agree, 4= Agree, 3= Undecided, 2= Disagree and 1= Strongly Disagree) to indicate degree of agreement with the highlighted statement.

The respondents rated the factors that contributed to poor performances in mathematics and sciences. These have been summarised in Table 4.5.

Table 4.5: Factors contributing to poor performances among girls

	Strongly Agree (%)	Agree (%)	Undecided (%)	Disagree (%)	Strongly Disagree (%)
Lack of good learning environment	0	42.6	17.8	24.8	14.9
Teaching aids	0	52.5	10.9	27.7	8.9
Lack of parental involvement	0	51.5	19.8	21.8	6.9
Lack of proper preparation before examinations	22.8	52.5	13.9	10.9	0
Biased instructional methods	0	51.5	17.8	17.8	12.9
Incompletion of syllabus	0	63.4	23.8	12.9	0
Lack of interest	10.9	21.8	29.7	37.6	0
Lack of qualified teachers	9.9	22.8	14.9	51.5	1.0

From Table 4.5, 42.6% of the female respondents agreed that the learning environment had an influence in their performances in mathematics and science subjects; however, 24.8% were of a contrary view. 51.5% agreed that their parents were not so much involved in their academics works. However, a total of 28.7% of the girls said that their parents shown some interest in their performances especially in mathematics and sciences. Lack of proper preparation is another challenge that the respondents found to influence their performances. The majority of the female students (a total of 75.3%) said that they failed to perform well in mathematics and sciences due to poor preparation for examinations. Also 63.4% blamed the incompletion of the syllabus as a contributing factor in their poor performance in the subjects. 52.5% felt that the inadequacy of teaching media and subject apparatus also contributed to their poor performances. A total of 32.7% admitted to lack interest in the subjects. Although a total of 52.5% of the students agreed that their teachers were qualified, a total of 30.9% of the students said that they lacked qualified teachers to handle mathematics and science subjects

Table 4.6: Presentation rating

Variable	Rating	Frequency	Percentage
Reasons for choice	Own decision	51	50.5
	External Influence	12	11.9
	School system	38	37.6
	Forced by teacher	0	0
Method of Presentation	Too theoretical	18	17.8
	Good balance	81	80.2
	Too practical	2	2.0
Presentation skills	Very good	11	10.9
	Good	70	69.3
	Reasonable	13	12.9
	Poor	7	6.9
	Very poor	0	0

In addition, 50.5% of the female respondents said that they had made the decision to choose the science subjects they were taking while 37.6% said they were forced by the school system to take certain science subjects. The school's system dictated which subjects were to be taken in certain streams. Therefore some students were forced to take the subjects that were available for such streams even though they are not their preferred subjects. Mathematics and chemistry are compulsory in the Kenyan education system, but schools can also dictate which other subjects will be compulsory. For example biology was a compulsory subject in State House Girls, Kenya High, Parklands Arya Girls and Nairobi Milimani Secondary. Physics was not offered at Highridge Secondary School for the 2011 candidates.

A total of 80.2%female students agreed that the presentation skills and techniques were appropriate but 6.9% were not comfortable with the skills and techniques. Another 12.9% of the girls rated the presentation skills and techniques as just reasonable. 80.2% said that the subjects' presentations were well balanced out between theory and practical lessons. Only 17.8% felt that

the presentations were too theoretical and another 2.0% said that the presentations were too practical.

Other challenges that were identified as contributing to the poor performances were home chores and responsibilities. This was particularly among the day scholars. Most girls said they performed other duties at home that consumed most of their valuable time that could otherwise be spent in revising and preparing for the next school day. The girls are required to look after their young siblings, help in the kitchen, business, laundry etc.

4.6 Strategies for Improvement

The strategies for improvement were measured using open ended questions and observation.In open-ended questions the respondents were given room to explain their answers in detail which also strengthened the closed questions responses.

Some of these strategies include the strengthening of teaching resources where teachers need to be equipped with all the necessary material e.g. text books, regular continuous assessments tests were also mentioned as a strategy that can be used to improve the students' performance in the subjects.

From the questionnaires, the teachers were able to give how often they administered assessments. The number of times the teachers gave assessments is shown in Table 4.7.

Table 4.7: Assessment of the subjects

		Frequency of assessing the subject			
Years of teaching		**Twice a term**	**Once a month**	**Every two weeks**	**Total**
1-5	Count	0	1	2	**3**
	% of Total	0	2.5	5.0	**7.5**
6-10	Count	0	8	0	**8**
	% of Total	0	20.0	0	**20.0**
11-15	Count	1	11	0	**12**
	% of Total	2.5	27.5	0	**30.0**
16-20	Count	2	10	0	**12**
	% of Total	5.0	25.0	0	**30.0**
Above 20	Count	4	1	0	**5**
	% of Total	10.0	2.5	0	**12.5**
Total	**Count**	**7**	**31**	**2**	**40**
	% of Total	**17.5**	**77.5**	**5.0**	**100.0**

From Table 4.7, 77.5% of the teachers assessed their students once a month. Only 5.0% of the teachers assessed their students every two weeks. These were noted to be those with less than five years of teaching experience. A total of 17.5% of the teachers assessed their students twice a term. These were noted to be the more experienced teachers with more years of teaching.

All the teachers agreed that continuous assessments were very useful both to teachers and students. Teachers were able to establish the areas that they needed to concentrate on while the students were able to gauge what to expect in major examinations. This helped them to work on their weak areas. Retraining of teachers is very important because they need to be brought up to speed with some to teaching – learning methods that focus on student learning as opposed to what was the norm previously where teachers were seen as the centre of all information with very little or no involvement from the learners.

Teaching resources, teachers' qualifications, parental involvement and vocational guidance were suggested as strategies for improvement. They were the bases for poor performance as shown by the responses of all the respondents as summarised in Table 4.8.

Table 4.8: Strategies for improvement

Variable	Respondent	Strongly Agree (%)	Agree (%)	Undecided (%)	Disagree (%)	Strongly Disagree (%)
Lack of teaching resources	Students	0	52.4	11.3	26.2	10.1
	Teachers	0	62.5	7.5	30.0	0
	Principals	0	30.0	0	60.0	10.0
Lack of qualified Teachers	Students	8.9	22.0	13.7	53.6	1.8
	Teachers	0	0	0	35.0	65.0
	Principals	0	0	0	60.0	40.0
Lack of parental involvement	Students	0	53.0	20.8	20.2	6.0
	Teachers	0	50.0	15.0	35.0	0
	Principals	0	60.0	20.0	20.0	0
Lack of vocational guidance	Students	20.8	45.8	17.9	15.5	0
	Teachers	0	50.0	15.0	35.0	0
	Principals	20.0	50.0	10.0	20.0	0

A total of 52.4% of the students who participated in this study agreed that lack of adequate teaching media and subject apparatus contributed to their poor performance in mathematics and science subjects. In addition, 62.5% of the teachers who participated also agreed that teaching resources contributed to poor performance among the students. Although the majority of the head-teachers disagreed, probably because they are responsible for the provision of teaching resources in schools, 30.0% of them agreed that lack of teaching resources contributed to the

poor performance among the students in mathematics and science subjects. Majority of the students suggested that enough laboratory apparatus and other teaching aids should be provided. There are few apparatus currently such that the majority of the students just watched as either the teacher or one of the students performed an experiment. The much they got to feel the apparatus was when cleaning them after an experiment.

Enhanced teaching skills and subject presentations techniques are other strategies that can be used to improve the performance in the mentioned subjects. Although a total of 55.4%of the students agreed that their teachers were qualified, a total of 30.9% of the students said that they lacked qualified teachers to handle mathematics and science subjects. As expected however, all the teachers and head-teachers agreed that the teachers were qualified to handle the subjects. 20.0% of the teachers had master's degree while the remaining 80.0% of the teachers' participants had a Bachelor's Degree as shown in Table 4.3.

Parental involvement is another strategy that was fronted to improve the performance of girls in mathematics and sciences. A total of 53.0% of the students who participated in this study agreed that lack of parental involvement contributed to their poor performance in the subjects. 50.0% of the teachers and 60.0% of the head-teachers were of a similar view with only 20.0% of the head-teachers feeling that parental involvement was not a contributing factor. Parents in Nairobi are known to be very busy and concentrate more on their businesses or on how to make ends meet. Majority, therefore have very little time with their children and rarely get to know how they are performing in schools. Parental involvement is also key. This is because it is the parents who know their children's strengths and weaknesses and it has been noted that parents who take a keen interest in their children's school work are able to notice when there is a lapse in their performance.

Mentorship programmes and vocational guidance on different fields that are related to sciences is another strategy that was suggested to improve the performance of students in mathematics and sciences. A total of 66.6% of the students' participants agreed that they lacked vocational guidance and this could have led to their poor performances. A total of 70.0% of the head-teachers and 50.0% of the teachers were of a similar view. Mentorship programmes especially from the old-students were suggested, where the old-students could visit the schools and interact and share their experiences with the students. Vocational guidance of students is paramount. This

will guide the students to make wise decisions when picking clusters of subjects that will enable them know what is needed for the career paths that they have chosen.

CHAPTER FIVE

SUMMARY OF FINDINGS, DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter consists of summary of the research findings, a discussion of the findings and recommendations based on the research findings. This research was guided by four objectives and four research questions. The descriptive survey research method was used and questionnaires and observation methods were used as the data collection methods. The summary of the findings is shown in Table 5.1.

5.1.2 Summary of findings

The first objective was to establish girls' performance in mathematics and science subjects in Kenya Certificate of Secondary Education in public secondary schools in Westlands District, Nairobi County. The means score for girls in mathematics was 4.095, 7.60235 in biology, 6.7651 in physics and 6.8934 in chemistry.

The performance in mathematics and science subjects varied depending on the category of school i.e. whether national or provincial school. National schools appeared to perform better with Kenya High School having a mean grade of 10.5025 in mathematics than the provincial schools with St Georges Girls Secondary School having a mean of 8.6288.

Performance also varied depending on the type of school i.e. whether mixed or single gender schools. Single gender schools performed better than the mixed schools under the same category. The mean score for mathematics in mixed schools was 5.8135, 6.8808 in biology, while that of single gender schools was 6.1358 in mathematics and in biology 8.7301. Boarding schools appeared to perform better than day schools. For instance the mean for biology at Kenya High School which is a boarding school was 10.009 as compared to that of Parklands Arya Girls, a day school which managed a mean of 5.3374 in biology.

The second objective was to assess boys' performance in mathematics and science subjects in Kenya Certificate of Secondary Education in public secondary schools in Westlands District, Nairobi County. The findings were as follows; the mean score for boys in national examinations

in mathematics was 4.7619, 7.2954 in physics and 7.0098 in chemistry, and lower in biology than girls with a mean of 5.9187.

Preference for biology among boys is lower as compared to girls while more boys preferred physics as an elective subject as compared to girls.

Performance in mathematics and science subjects varied depending on the category of school i.e. whether national or provincial school. National performed better with Nairobi School having a mean of 9.7133 in mathematics than the provincial schools with Nairobi Milimani Secondary for example having a mean of 2.0423.

Performance also varied depending on the type of school i.e. whether mixed or single sex school. Single sex schools performed better than the mixed schools under the same category. The mean score for mathematics in mixed schools was 5.8135 while that of single gender schools was 6.1358. Boarding schools performed better than day schools.

The third objective was to examine challenges faced by girls in mathematics and science subjects in public secondary schools in Westlands District, Nairobi County. The major challenges facing girls in mathematics and science subjects in KCSE include the following;

42.6% of the girls agreed that the learning environment had an influence in their performances in mathematics and science subjects

52.5% of the girls felt that the inadequacy of teaching media and subject apparatus contributed to their poor performances.

51.5% of the girls agreed that their parents were not so much involved in following up on their academic performance.

75.3% of the girls said that they failed to perform well in mathematics and sciences due to poor preparation for examinations and 63.4% blamed the incompletion of the syllabus as a contributing factor in their poor performance in the subjects.

32.7% of the girls admitted to lack interest in the subjects and thus the poor performances.

Candidates in day schools performed poorly due to performing other duties at home that consumed most of their valuable time at the expense of their education.

To assess strategies that can be adopted in order to improve girls' performance in mathematics and science subjects in public secondary schools in Westlands District, Nairobi County. The

important strategies which can be used to improve girls performance include; provision of adequate teaching resources including laboratory apparatus will make every student appreciate practical lessons.

Regular continuous assessment tests will be able to reveal the students' weak areas and thus enable the teachers to prepare their students well for major examinations.

Enhanced teaching skills and appropriate presentation skills will ensure concentration in class and better understanding.

Parental involvement in their children's performances will ensure monitoring and evaluation of his/her child's performance.

Mentorship programmes, role models and vocational guidance on different fields that are related to sciences will make the students have a clear goal of what they would like to be in future.

Strengthening of Guidance and Counselling is schools will help improve discipline in schools and therein, performance

5.2 Discussion of Findings

This section covers the findings from data that was analysed after investigation the factors influencing performance in mathematics and science subjects in public secondary schools in Westlands District, Nairobi County.

The researcher successfully investigated and analyzed the girls' and boys' performances in KCSE national examinations in mathematics and science subjects, the challenges girls face in mathematics and science subjects and the strategies that can be adopted in order to improve girls' performance in mathematics and science subjects in public secondary schools in Westlands District, Nairobi County.

5.2.1 KCSE performance in mathematics and science

Data analysed on the performance in K.C.S.E examination in Westlands District over the past years have shown that there is indeed a disconnect in results posted by male and female students in mathematics and science subjects. Results of several examination years reveal that girls are out performed by boys in mathematics, science and technical subjects at the Kenya Certificate of

Secondary Education (KCSE). This renders them unable to attain equal parity with their male counterparts in joining the world of sciences at the university level (Agesa and Agesa, 2002). The findings of this study are in agreement with the sentiments of the mentioned scholars. The results showed that in 2011 KCSE examinations, boys performed far much better in the selected schools. In mixed schools, where all conditions are similar, boys were found to perform better than girls.

Kiluva-Ndunda (2001) suggested reasons that can lead to poor performances among girls. These include biased instruction methods, more domestic chores for girls and harassment in the school system. Examples of biased instruction include, the documented practice of teachers in mixed schools asking the male students to perform science experiments and the female students to record results and clean up afterwards as well as learning materials based on gender stereotyped roles (FAWE, 2007). 51.5% of the girls who participated in this study were of the view that the instruction methods used in their schools were biased.

Liking is a frequent occasion for the development of personal relationships in that it predisposes people to enter into them. A person cannot develop a positive attitude towards something he or she does not like. Interest is the sin qua non-for affection and appreciation. A positive interest gives rise to a positive attitude towards something (Gill, 1995). This study revealed that boys had a higher preference for physics as compared to girls, also more girls preferred biology than boys. As a result, the girls' performance in biology was marginally higher than that of boys despite boys shining in the other subjects. A negative attitude towards science subjects by learners could play a role in the poor performance and passing rate. This study revealed that 24.4% of the students had a negative attitude towards mathematics and sciences. 32.7% of the respondents admitted that lack of interest in the subjects contributed to their poor performances. Poor examination performance in science subjects and mathematics limits girls' opportunities to pursue higher education because students' academic performance and career choices at the primary and secondary level have lifetime ramifications in terms of employment opportunities (Tumuti, 1986; Osoro et.al, 2000). Performance in Kenya Certificate of Primary Education determines which rank of secondary school a student will attend. This in turn affects their likelihood of attending universities and other tertiary institutions. This study revealed that the students in national schools (Nairobi School and Kenya High) performed much better than

other students in other categories of schools. Performing better in mathematics and science subjects in the KCSE increased the chances of joining universities and higher institutions of learning. For attainment of the Millennium Development Goals and Vision 2030, the girl-child's education must be emphasised. It is important for the policy makers, education ministry administrators and management to understand the challenges facing the girl-child in pursuit of education and the strategies that can be appropriately explored curb such challenges.

5.2.2 Challenges facing girls in mathematics and science subjects

Girls face many challenges in mathematics and science subjects which lead to poor performance.

Poor performance is caused by various factors. Some of the factors that influence quality education include: teacher quality, availability of facilities, instructional resources, infrastructure, supervision of instruction, provision of school meals, hands-on and learner centred methods and approaches, parental involvement and learner-friendly environment (Yeya, 2002).

A serene environment must be created for knowledge to be fostered on the part of the child. According to Vernon (1986) "an environment must be created which is stimulating enough for children to develop their abilities and satisfy their interests." He states further that "it is important that the child be happy in school, that his/her life develop from day to day with a feeling of achievement, that he/she consider himself/herself a person of work, that he/she feels that he/she is understood and appreciated, and that he/she has opportunities to express his/her creative and artistic abilities.

Equipment shortages in schools and inadequate or not present teaching media also contribute to the poor performances in schools. The lack of teaching media and subject apparatus e.g. laboratory facilities is another factor that contributes towards the poor performance and passing rate of science subjects. This means that most of the teaching is based on theory (Ornstein, 1992). Sciences are practical subjects and some of the concepts need to be demonstrated practically. Teltchik and Hamm (1998) mentions, that "there was an international agreement that teacher training in media education is either missing altogether or notably inadequate, apart from the fact that media education also suffers from adequate conceptual and theoretical base. "Equipment shortages coupled with lack of subject knowledge on the part of teachers

teaching the subject enhance this problem further.Yeya (2002) agreed that schools with adequate facilities perform better in National Examination especially in core subject such as mathematics.52.4% of the students' participant agreed that lack of adequate teaching resources contributed to the poor performances in examinations. 62.5% of the teachers and 30.0% of the head-teachers were of a similar opinion.

Teaching is a professional occupation which is guided by a self-conscious understanding of basic educational principles, rather than by any narrow concern with instrumental or utilitarian goals and motives. Teachers' skills can motivate or demoralise his/her students (Carr and Kemmis, 1986). Teachers who lack good teaching skills cannot be expected to produce good results. If teachers have problems on the subject itself, it is worse on the part of the learners. Understanding requires matching materials to the learners' abilities and prior knowledge. If students do not understand the materials, frustrations sets in, making learning more difficult (Ornstein, 1992).Little wonder that many teachers lose their pupils' interests after 10-15 minutes of instruction. Learners dose off, stare out of the windows or stare past the teacher or just pass time in classrooms.55.4% of the students agreed that their teachers were qualified but another 30.9% of the students said that they lacked qualified teachers to handle mathematics and science subjects. 78.6% agreed that the presentation skills and techniques were appropriate but 6.0% were not comfortable with the skills and techniques. Another 15.5% of the students rated the presentation skills and techniques as just reasonable.

Lack of practical lessons give rise to such a limited scientific basis of teaching. Laboratory facilities help students to understand certain concepts learned in the classroom. The gap between theoretical knowledge and practical knowledge is in fact bridged via practical lessons. Learners cannot apply in practice what they are taught theoretically. Learning theory without practical lessons is rendering the learning-teaching situation to be less effective thus also possibly contributing to the high failure rate of the subject. 79.8% of the students' respondents were of the opinion that the subject presentations in their schools were well balanced between theory and practical lessons despite the scarcity of laboratory apparatus and equipment. They were able to make good use of what they had.

Career guidance is lacking and there is a perception that female learners do not see sciences as a subject with professional status. This study revealed that 66.6% of the students' participants

agreed that they lacked vocational guidance and this could have lead to their poor performances. 50.0% of the teachers and 70.0% of the head-teachers were of a similar view. Mentorship programmes especially from the old-students was suggested, where the old-students could visit the schools, interact and share their experiences with the students. The educators do not regard the professional status of the subject as important. This is due to lack of vocational guidance on different fields that are related to science. Teachers are not offering enough opportunities for learners to become involved in science related school and community activities. There is a total failure of praise and opportunities for learners to increase their social, academic independence and responsibility.

Syllabus coverage affects the performance of a student. Late or non-coverage of the syllabus contributes to poor performance. Poor syllabus coverage springs from under teaching which is attributed to lack of sufficient teaching staff and insufficient or inadequate teacher preparedness (Shikuku 2012).According to this study 63.4% blamed the incompletion of the syllabus as a contributing factor in their poor performance in the subjects. 75.3% said that they failed to perform well in mathematics and sciences due to poor preparation for examinations.

5.2.3 Strategies for improvement

Measures which can be taken to improve performance of girls in mathematics and science subjects in KCSE include parental involvement, regular assessment, provision of teaching resources, retraining of teachers and vocational guidance of students.

The teacher is a prime factor in the performance of students. In a study carried out by Wanjohi and Yara (2011) teachers' qualification was found to be significant and could also used to predict students' performance in mathematics. Although 55.4% of the students agreed that their teachers were qualified, 30.9% of the students said that they lacked qualified teachers to handle mathematics and science subjects. 78.6% agreed that the presentation skills and techniques were appropriate but 6.0% were not comfortable with the skills and techniques. 15.5% of the students rated presentation skills and techniques as reasonable. However, all the teachers and head-teachers agreed that the teachers were qualified to handle the subjects. 20.0% of the teachers had master's degree while the remaining 80.0% of the teachers' participants had a bachelor's degree.

Provision of adequate teaching resources including laboratory apparatus will make every student appreciate practical lessons (Carr and Kemmis, 1986). 52.4% of the students who participated in this study agreed that lack of adequate teaching media and subject apparatus contributed to their poor performance in mathematics and science subjects. In addition, 62.5% of the teachers who participated also agreed that teaching resources contributes to poor performance among the students. Majority of the head-teachers disagreed as 30.0% agreed that lack of teaching resources contributed to the poor performance among the students in maths and science subjects in KCSE.

Regular tests were mentioned as a strategy that can be used to improve the students' performance in the subjects. These tests will be able to reveal the students' weak areas and thus enable the teachers to prepare their students well for major examinations. All the teachers agreed that continuous assessments were very useful both to teachers and students. Teachers were able to tell the areas that they were needed to concentrate on while the students were able to tell what to expect in major examinations. 77.7% of the teachers assessed their students once a month. 5.0% of the teachers assessed their students every two weeks. These were noted to be those with less than five years of teaching experience. The more experienced teachers assessed their students twice a term. They accounted for 17.5% of the teachers and the majority (57.1%) had over 20 years of teaching experience.

Jacobs (1991) states that to study means to learn purposefully and deliberately. Studying is therefore always a purposeful activity. The learners' strength on the subjects is not good because there is nothing motivating which makes the learners to be interested in them. They just do the subjects with no career prospects attached to them. The strength of coping with the subject arises from the children's interests. In order to ensure that girls take up science oriented career paths, education stake holders should organize and oversee mentoring through peer educators to positively influence career choices at school level. Mentorship programmes, role models and vocational guidance on different fields that are related to sciences will make the students have a clear goal of what they would like to be in future. 66.6% of the students' participants agreed that they lacked vocational guidance and this could have lead to their poor performances. 50.0% of the teachers and 70.0% of the head-teachers were of a similar view. Mentorship programmes especially from the old-students was suggested, where the old-students could visit the schools and interact and share their experiences with the students.

Learners taking the sciences are not aware of what the subjects they are taking can bring to them. Educational and occupational information are not being provided and interpreted to learners in the field of science. Learners are not guided to explore the educational and occupational possibilities in the field of science hence knowing very little or none at all about vocations related to science.

Parental involvement in their children's performances will ensure monitoring and evaluation of his/her child's performance. By engaging in educational activities with their children at home such as supporting homework and modelling reading behaviour, parents communicate clear expectations for achievement, while integrating school curriculum goals within the home. A disconnect between parents and the educational learning experiences of their children result in the child's behavioural problems at school, stress in accomplishing one's responsibilities and weakness in academic performance (Mc Wayne, 2004).A total of 53.0% of the students who participated in this study agreed that lack of parental involvement contributed to their poor performance in the subjects and 50.0% of the teachers agreed with the same. 60.0% of the head-teachers were of a similar view with only 20.0% of the head-teachers feeling that parental involvement is not a contributing factor. Parents in Nairobi are known to be very busy and concentrate more on their businesses or on how to make ends meet. Majority therefore have very little time with their children and rarely get to know how they are performing in schools.

5.3 Conclusions

The following conclusions were made from the study which investigated on girls' performance in mathematics and science subjects in Kenya Certificate of Secondary Education in Westlands District, Nairobi County.

1. Boys performed better than girls in mathematics, physics and chemistry whereas girls performed better than boys in biology.
2. The performance in mathematics and science subjects varied depending on the category of school. National schools performed better than the provincial and district level schools.
3. Performance also varied depending on the type of school i.e. whether mixed or single gender school. Single gender schools performed better than the mixed schools under the same category.

4. Students in boarding schools performed better in mathematics and science subjects than those in day schools.
5. The major challenges facing girls in mathematics and science subjects in KCSE include the following; lack of conducive learning environment, inadequacy of teaching media and subject apparatus contributed to their poor performance, lack of parental involvement in following up on their academic performance, poor preparation for examinations and incompletion of the syllabus, lack of interest in the subjects and thus the poor performances.
6. Important strategies that can be used to improve girls' performance in mathematics and science subjects in KCSE include; provision of adequate teaching resources including laboratory apparatus which will enable every student appreciate practical lessons, regular continuous assessment tests which will reveal the students' weak areas and thus enable the teachers prepare their students well for major examinations, enhanced teaching skills and appropriate presentation skills will ensure concentration in class and better understanding, parental involvement in their children's performances will ensure monitoring and evaluation of his/her child's performance. Mentorship programmes, role models and vocational guidance on different fields that are related to sciences will make the students have a clear goal of what they would like to be in future and strengthening of guidance and counselling in schools will help improve discipline in schools and therein, performance.

5.4 Recommendations

The following recommendations are made from the findings of the research. The research findings and interpretation reveal that measures need to be taken to ensure that the performance of girls in KCSE and other major national examinations improves.

1. Girls should be encouraged to change their attitude towards mathematics and sciences so that they will be able to take up science based careers. This will be guided by the vocational and career guidance counselling. This will in turn enhance discipline in the girls.

2. Boys should be encouraged to also take up biology and change their perception about it because it is evident from the data analysed that boys performance was lower than that of girls in biology.
3. Single gender schools are also recommended. This is evident from the schools that participated in the study where single gender schools performed better than mixed schools in mathematics and science subjects in public day secondary schools in Westlands District, Nairobi County.
4. There should be an immediate plan to have as many boarding schools as possible to enable candidates who are in day schools perform better seeing as candidates in boarding schools performed better than them and if this cannot be achieved then learning and teaching resources should be improved in day schools.
5. It is critical that teachers are involved in refresher courses, which because they will be conducted by different people, should hopefully result in changes from their normal practice. Outdated teaching practices and lack of basic content knowledge have resulted in poor teaching standards.
6. Parents should be encouraged to participate in their children's education.Parents have a distinct advantage over anyone else in that they can provide a more stable and continuously positive influence that could enhance and complement what the school fosters on their children. In this regard, parental involvement is undeniably critical. By engaging in educational activities with their children at home such as supporting homework and modelling reading behaviour, parents communicate clear expectations for achievement, while integrating school curriculum goals within the home.
7. It is recommended that relevant school-based, clustered, provincial and national workshops targeting mathematics and science teachers should be conducted. Such workshops, which would be part of continuous professional development, should provide a platform where teachers share their knowledge, strategies that work, problems and frustrations, as well as allow them to be up to date with innovations in education in general.
8. In addition, teachers, parents, old students and other stakeholders should also hold academics clinics where they will sensitize the importance of mathematics and science subjects to the students. Career counseling and vocational guidance will motivate the

students more and they will be able to change their view of who they are and who they can become. By providing students with a reason for studying mathematics and sciences, the teachers, old students and stakeholders give students a reason for wanting to learn mathematics and sciences.

9. Educative tours or excursions that are science oriented should be undertaken. This will enrich the learners with information and in-depth knowledge of the sciences.Teachers need to be confident with respect to knowledge of the subjects they teach, have a grasp of common misconceptions learners present in the classroom, and possess strategies for inducing learners' conceptual change.
10. The Joint Admissions Board should also lower the entry points into universities for girls in rural and urban areas further. This will increase the enrolment percentages in universities and science courses in institutions of higher learning.

5.5 Suggestions for Further Studies

Similar studies should be carried out in other urban areas and in rural areas to ascertain if the case will be true for them as they have been for Westlands District, Nairobi County.

This study also suggests further research should be done on parents' role in their children's education. Parental involvement is paramount in the academic success of their children. Parents have the distinct advantage over anyone else in that they can provide a more stable and continuously positive influence that could enhance and complement what the school fosters on their children. It is therefore important to get the parents side of the story on academics performances of their female children.

Additionally, studies can be carried out to establish how day schools can be improved. This can be seen from the results of the 2011 KCSE results in mathematics and science subjects of the day schools that took part in the study. Their performance was dismal if compared to that of their counterparts who are in boarding schools and participated in the study.

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APPENDICES

APPENDIX 1: LETTER OF INTRODUCTION

CATHERINE RAUTTA

P.O. Box 52036 – 00200

Nairobi.

Dear Participant,

I am a post graduate student at the University of Nairobi carrying out a research on Factors Influencing Girls' Performance in Science subjects in the Kenya Certificate of Secondary Education in Public Secondary Schools in Westlands District, Nairobi County.

I request you to answer each question honestly and precisely. Please note that the information provided will be treated with utmost confidentiality.

Yours faithfully,

Rautta Catherine

Reg. No. L50/62241/2011

APPENDIX 2: QUESTIONNAIRE FOR STUDENTS

Instructions. Please place a tick where necessary or kindly write your answer in the spaces provided.

PART A

Demographic information

1. (i) Name of School: _____

(ii) Type of School: District [ ] Provincial [ ] National [ ]

(iii) Age in years: 13-15 [ ] 15-17 [ ] Above 17 [ ]

(iv) Gender: Female: [ ] Male [ ]

PART B

2. Which one of the following applies mostly to the reason for your choice in the science subjects you are taking?

i). Decided on my own [ ]

ii). Influenced by friends/teachers/parents [ ]

iii). Forced by subject choice in school [ ]

iv). Forced by teacher(s) to take them [ ]

Others, specify: _____

3. How do you rate the presentation of the science subjects by your teachers?

i). Too theoretical [ ]

ii). Good balance [ ]

iii). Too practical [ ]

4. (i) In your opinion, do you think your science teachers are doing their best to make the teaching-learning process of science subjects as interesting as possible?

Yes [ ] No [ ]

(ii) Give two reasons for your answer if your answer is No in 5(i).

_____

_____

_____

5. Rate the teaching skills of the teacher (s) who teach you the science subjects.

Very Good [ ] Good [ ] Reasonable [ ] Poor [ ] Very Poor [ ]

6. (i) Do you find the science subjects you are studying relevant to your career choice?

Yes [ ] No [ ]

(ii) Give two reasons for your answer, if answer is No.

_____

_____

_____

7. Give two suggestions you have for science teachers in order to help you improve in your science subjects.

_____

_____

_____

_____

8. Give two suggestions on how practicals in science subjects can be improved.

_____

_____

_____

_____

_____

9. Which of the following factors, in your opinion account for the poor performance in science subjects?

	5 Strongly Agree	**4 Agree**	**3 Undecided**	**2 Disagree**	**1 Strongly Disagree**
i). Lack of interest in the subjects					
ii). Lack of a good school learning environment					
iii). Negative attitude toward sciences					
iv). Lack of teaching media and subject apparatus					
v). Lack of qualified teachers					
vi). Lack of parental involvement					
vii). Lack of proper preparation before examinations					
viii). Lack of vocational guidance on different fields that are related to science					
ix). Biased instruction methods					
x). Incompletion of syllabus					

(ii) Any other, specify.

_____

_____

_____

10. Give up to three strategies which can be employed to improve the performance in science subjects in your school

_____

_____

_____

Thank you very much for your co-operation and assistance.

APPENDIX 3: QUESTIONNAIRE FOR TEACHERS

Please tick where necessary or kindly write your answer in the spaces provided.

PART A

Demographic information

i). Name of School: _____

ii). Type of School: District [ ] Provincial [ ] National [ ]

iii). Which of the following class (es) do you teach?

Class: Form 1 [ ] Form 2 [ ] Form 3 [ ] Form 4 [ ]

iv). Age in years: 20-30 [ ] 30-40 [ ] 40-50 [ ] Above 50 [ ]

v). Gender: Female: [ ] Male [ ]

vi). Number of students in class: _____

vii). Level of Education

Certificate [ ] Diploma [ ] Bachelors Degree [ ] Masters [ ] Doctorate [ ]

If others, specify._____

PART B:

2. Which of the following science subjects do you teach?

i). Mathematics [ ]
ii). Chemistry [ ]
iii). Physics [ ]
iv). Biology [ ]

3. How long have you been teaching?

4. Rate your students' attitude towards science subjects.

i). Very Positive [ ]
ii). Positive [ ]
iii). Neutral [ ]
iv). Negative [ ]
v). Very negative [ ]

5. How often do you assess your subject? (Mark one option that best describes how often you assess your subject)

i). once a week [ ]
ii). once a month [ ]
iii). every two weeks [ ]
iv). twice a term [ ]
v). about every lesson [ ]

Others Specify. _____

6. Assessment is useful to me. (*Mark one on the given scale*)

i). Strongly Agree [ ]
ii). Agree [ ]
iii). Disagree [ ]
iv). Strongly disagree [ ]

(ii) Give one reason for your answer

_____

_____

_____

7. Assessment is useful to my students. (*Mark one on the given scale*)

i). Strongly Agree [ ]
ii). Agree [ ]

iii). Disagree [ ]

iv). Strongly disagree [ ]

Why?

_____

_____

_____

8. Which of the following in your opinion, account for some of the reasons for poor performance in science subjects by your students?

	5 Strongly Agree	**4 Agree**	**3 Undecided**	**2 Disagree**	**1 Strongly Disagree**
i). Lack of interest in the subjects					
ii). Lack of a good school learning environment					
iii). Negative attitude toward sciences					
iv). Lack of teaching media and subject apparatus					
v). Lack of qualified teachers					
vi). Lack of parental involvement					
vii). Lack of proper preparation before examinations					
viii). Lack of vocational guidance on different fields that are related to science					
ix). Biased instruction methods					
x). Incompletion of syllabus					
xi). Examination malpractice					
xii). Incessant strike action					

8 (ii) Any other, specify.

_____

_____

_____

9. In your opinion, does the type of school (whether single gender or mixed, private or public) have an effect on academic performance of students in sciences?

Yes [ ] No [ ]

Give two reasons for your answer if your answer is yes.

_____

_____

_____

10. Give up to four strategies which can be employed to improve students' performance in science subjects?

_____

_____

_____

_____

_____

_____

_____

_____

Thank you very much for your co-operation and assistance.

APPENDIX 4: HEAD TEACHERS QUESTIONNAIRE

Please tick where necessary or kindly write your answer in the spaces provided.

PART A: Demographic Information

i). Name of school:

ii). Type of school: District [ ] Provincial [ ] National [ ]

iii). Age in years: 20-30 [ ] 30-40 [ ] 40-50 [ ] Above 50 [ ]

iv). Gender: Female [ ] Male [ ]

v). Level of Education

Certificate [ ] Diploma [ ] Bachelors Degree [ ] Masters [ ] Doctorate [ ]

If others, specify._____

PART B:

1. For how long have you been a head teacher?

1-5 years [ ] 6-10years [ ] 11-15years [ ] 16-20 years [ ] above 20years [ ]

2. Are you a teacher of science subjects? Yes [ ] No [ ]

If yes, please write down the subjects that you teach.

_____

_____

_____

_____

3. How has the mean performance in science subjects been in your school in the last three years?

i). On the rise [ ]

ii). On the decline [ ]

iii). Constant [ ]

4. (i) Have you ever organized career talks related to the science subjects the learners are pursuing?

Yes [ ] No [ ]

(ii) Give two reasons for your answer in 5 (i) above if the answer is yes.

_____

_____

_____

_____

5. Do the science teachers in your school attend seminars in science subjects, e.g. SMASSE?

Yes [ ] No [ ]

(ii) If yes, specify.

_____

_____

_____

6. Which of the following in your opinion, account for some of the reasons for poor performance in science subjects by your students?

	5 Strongly Agree	**4 Agree**	**3 Undecided**	**2 Disagree**	**1 Strongly Disagree**
i). Lack of interest in the subjects					
ii). Lack of a good school learning environment					
iii). Negative attitude toward sciences					
iv). Lack of teaching media and subject apparatus					

v). Lack of qualified teachers					
vi). Lack of parental involvement					
vii). Lack of proper preparation before examinations					
viii). Lack of vocational guidance on different fields that are related to science					
ix). Biased instruction methods					
x). Incompletion of syllabus					
xi). Examination malpractice					
xii). Incessant strike action					

7 (ii) any other, specify.

_____

_____

_____

_____

8. In your opinion, does the type of school (whether single gender or mixed, private or public) have an effect on academic performance of students in sciences?

Yes [ ] No [ ]

Give up to three reasons for your answer if your answer is yes.

_____

_____

_____

_____

_____

_____

9. Give up to three strategies that can be employed to improve students' performance in science subjects?

_____

_____

_____

_____

_____

Thank you very much for your co-operation and assistance.

APPENDIX 5: KCSE PERFORMANCE IN MATHEMATICS

	SCHOOL	CATEGORY	ENTRY IN MATHS	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E	MEAN
1.	Nairobi School	M	282	127	24	29	17	20	20	13	7	6	10	6	0	9.7133
2.	St. George's Girls	F	233	62	21	23	31	12	18	19	11	12	13	7	0	8.6288
3.	State House Girls	F	205	13	14	13	12	15	15	22	20	19	38	16	6	6.0739
4.	The Kenya High	F	204	119	27	10	10	11	8	4	2	3	9	0	0	10.5025
5.	Kangemi High	M	154	3	0	1	1	3	5	4	3	7	19	36	67	2.5302
6.	Hospital Hill High School	M/F	M-46 F-50 96	M-3 F-2 5	M-2 F-2 4	M-2 F-0 2	M-4 F-1 5	M-4 F-3 7	M-5 F-3 8	M-3 F-5 8	M-3 F-5 8	M-3 F-5 8	M-7 F-16 23	M-4 F-7 11	M-5 F-1 6	M:5.7778 F:4.7600
7.	Parklands Arya Girls	F	172	3	1	3	3	4	12	7	9	14	23	46	37	3.4601
8.	Lavington Mixed Secondary	M/F	M-55 F-34 89	0	0	0	M-1 F-0 1	0	M-1 F-0 1	M-1 F-0 1	M-6 F-0 6	M-0 F-1 1	M-4 F-7 11	M-9 F-6 15	M-32 F-20 52	M:2.1111 F:1.6765
9.	Nairobi Milimani Secondary	M	77	1	0	0	1	1	1	3	2	2	1	11	48	2.0423
10.	Highridge Mixed Secondary	M/F	M-16 F-11 27	0	0	0	0	0	0	M-1 F-0 1	0	M-1 F-0 1	M-2 F-0 2	M-2 F-2 4	M-9 F-9 18	M:1.9333 F:1.1818

Source: ***Kenya National Examination Council (2011)***

APPENDIX 6: KCSE PERFORMANCE IN BIOLOGY

	SCHOOL	CATE GORY	ENTRY	ENTRY IN BIO	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E	MEAN
1.	Nairobi School	M	282	249	76	37	48	48	20	9	10	0	0	1	0	0	10.1084
2.	St. George's Girls	F	233	197	7	14	26	32	39	32	17	13	8	5	0	0	7.9586
3.	State House Girls	F	205	205	2	6	22	26	24	44	34	26	7	12	0	0	7.1035
4.	The Kenya High	F	204	204	52	33	53	28	17	11	6	2	1	0	0	0	10.0099
5.	Kangemi High	M	154	115	0	1	2	7	4	6	12	12	14	32	15	7	4.3661
6.	Hospital Hill High School	M/F	M-46 F-50 96	M-46 F-50 96	M-2 F-0 2	M-3 F-3 6	M-6 F-2 8	M-3 F-8 11	M-3 F-2 5	M-3 F-7 10	M-4 F-14 18	M-10 F-6 16	M-2 F-5 7	M-7 F-3 10	M-2 F-0 2	0	M:6.5778 F:6.6600
7.	Parklands Arya Girls	F	172	172	0	4	5	13	14	14	18	21	24	41	8	1	5.3374
8.	Lavington Mixed Secondary	M/F	M-55 F-34 89	M-37 F-31 68	0	0	0	M-3 F-0 3	M-0 F-2 2	M-0 F-2 2	M-1 F-4 5	M-4 F-3 7	M-2 F-5 7	M-16 F-7 23	M-10 F-6 16	M-0 F-2 2	M:3.5833 F:4.0000
9.	Nairobi Milimani Secondary	M	77	77	1	0	0	1	1	3	2	6	9	18	21	9	3.2817
10.	Highridge Mixed Secondary	M/F	M-16 F-11 27	M-16 F-11 27	0	0	0	0	0	0	M-0 F-1 1	M-1 F-0 1	M-3 F-0 3	M-5 F-4 9	M-3 F-5 8	M-3 F-1 4	M:2.7333 F:2.6364

Source: ***Kenya National Examination Council (2011)***

APPENDIX 7: KCSE PERFORMANCE IN PHYSICS

	SCHOOL	CATEGORY	ENTRY	ENTRY IN PHY	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E	MEAN
1.	Nairobi School	M	282	203	109	16	35	18	11	5	4	4	0	1	0	0	10.6700
2.	St. George's Girls	F	233	111	15	16	21	17	9	17	6	8	0	0	0	0	6.0459
3.	State House Girls	F	205	67	7	5	8	7	7	16	9	3	4	1	0	0	7.0299
4.	The Kenya High	F	204	109	54	13	23	8	6	3	2	0	0	0	0	0	9.7706
5.	Kangemi High	M	154	57	1	1	0	0	1	0	4	5	3	13	17	12	5.1053
6.	Hospital Hill High School	M/F	M-46 F-50 96	M-22 F-24 46	M-2 F-13	M-2 F-02	M-1 F-01	M-1 F-01	M-2 F-02	M-3 F-69	M-2 F-57	M-2 F-13	M-1 F-56	M-4 F-48	M-0 F-22	M-1 F-01	M:6.7143 F:5.2083
7.	Parklands Arya Girls	F	172	42	0	0	0	3	2	6	7	7	9	5	3	0	5.2143
8.	Lavington Mixed Secondary	M/F	M-55 F-34 89	M-18 F-3 21	0	M-1 F-01	0	0	M-1 F-01	0	M-2 F-02	M-2 F-02	M-3 F-14	M-4 F-26	M-5 F-05	0	M:4.1667 F:3.3333
9.	Nairobi Milimani Secondary	M	77	9	0	1	0	1	0	0	0	3	0	3	1	0	6.1111
10.	Highridge Mixed Secondary	M/F	M-16 F-11 27	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Source: ***Kenya National Examination Council (2011)***

APPENDIX 8: KCSE PERFORMANCE IN CHEMISTRY

	SCHOOL	CATEGORY	ENTRY	ENTRY IN CHEM	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E	MEAN
1.	Nairobi School	M	282	282	69	43	36	33	26	26	15	11	9	8	3	0	9.1720
2.	St. George's Girls	F	233	233	24	16	15	32	21	36	29	30	12	12	2	0	7.5721
3.	State House Girls	F	205	205	12	12	13	23	18	19	31	25	18	24	8	0	6.7044
4.	The Kenya High	F	204	204	68	25	28	29	14	18	10	6	2	3	0	0	9.7389
5.	Kangemi High	M	154	154	0	2	0	1	2	4	6	9	18	34	40	32	5.9865
6.	Hospital Hill High School	M/F	M-46 F-50 96	M-46 F-50 96	M-5 F-16	M-3 F-25	M-3 F-14	M-2 F-35	M-1 F-23	M-2 F-68	M-6 F-814	M-2 F-810	M-8 F-917	M-8 F-917	M-3 F-14	M-2 F-02	M:6.0667 F:5.6400
7.	Parklands Arya Girls	F	172	172	0	0	0	2	2	7	22	19	10	40	49	12	3.5583
8.	Lavington Mixed Secondary	M/F	M-55 F-34 89	M-55 F-34 89	0	0	0	0	M-3 F-03	M-1 F-01	M-4 F-15	M-3 F-36	M-0 F-22	M-12 F-820	M-21 F-1536	M-10 F-515	M:2.9259 F:2.5882
9.	Nairobi Milimani Secondary	M	77	77	1	0	0	0	2	1	1	2	2	4	23	35	6.1409
10.	Highridge Mixed Secondary	M/F	M-16 F-11 27	M-16 F-11 27	0	0	0	0	0	0	0	0	M-2 F-02	M-3 F-14	M-6 F-612	M-4 F-48	M:2.2000 F:1.7273

Source: ***Kenya National Examination Council (2011)***

APPENDIX 9: OVERALL 2011 KCSE PERFORMANCE PER SCHOOL

No	Name	Entry	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E	X	Y	Z	W	MEAN
1	Nairobi School	282	34	100	55	42	25	17	4	1	1	0	0	0	1	0	0	2	9.9928
2	St. Georges Girls	233	3	27	39	68	45	30	8	9	0	0	0	0	2	0	0	2	8.7249
3	State House Girls	205	1	8	23	40	37	53	29	8	4	0	0	0	0	0	0	2	7.8177
4	Kenya High	204	42	67	54	19	12	7	2	0	0	0	0	0	1	0	0	0	10.3892
5	Kangemi High School	154	0	0	2	2	5	17	15	20	29	28	30	1	0	0	0	5	4.3490
6	Hospital Hill High School	M-46 F-50 96	0	M-1 F-1 2	M-8 F-2 10	M-3 F-1 4	M-4 F-11 15	M-8 F-12 20	M-7 F-17 24	M-8 F-5 13	M-3 F-1 4	M-1 F-0 1	M-2 F-0 2	0	M-1 F-0 1	0	0	0	M:6.8220 F:6.8600
7	Parklands Arya Girls	172	0	0	3	5	20	24	26	34	31	18	2	0	2	0	0	7	5.5890
8	Lavington High School	M-55 F-34 89	0	0	0	M-1 F-0 1	M-2 F-0 2	M-2 F-0 2	M-6 F-5 11	M-8 F-9 17	M-13 F-5 18	M-16 F-9 25	M-6 F-6 12	0	0	M-1 F-0 1	0	0	M:4.2037 F:3.9412
9	Nairobi Milimani Secondary	77	0	1	0	0	2	3	8	8	14	16	17	2	1	0	0	5	3.8873
10	Highridge Secondary	M-16 F-11 27	0	0	0	0	0	0	M-3 F-0 3	M-1 F-0 1	M-5 F-2 7	M-1 F-6 7	M-5 F-2 7	M-0 F-1 1	0	0	0	M-1 F-0 1	M:3.7333 F:2.8182

Source: ***Kenya National Examination Council (2011)***

X - ABSENTEES Y - IRREGULARITIES Z - MISSING GROUP(S) P/W- PENDED/WITHHELD

APPENDIX 10: OVERALL 2011 KCSE PERFORMANCE PER GENDER

GRADE	GENDER			
	BOYS	PERCENTAGE	GIRLS	PERCENTAGE
A	34	5.4	46	5.1
A-	102	16.2	103	11.3
B+	65	10.3	121	13.3
B	48	7.6	133	14.6
B-	38	6.0	125	13.8
C+	47	7.5	126	13.9
C	44	7.0	86	9.5
C-	46	7.3	65	7.2
D+	65	10.3	43	4.7
D	61	9.7	34	3.7
D-	60	9.5	10	1.1
E	3	0.5	1	0.1
X	3	0.5	5	0.6
Y	1	0.2	0	0.0
Z	0	0.0	0	0.0
W	13	2.1	11	1.2
TOTAL	**630**	**100.0**	**909**	**100.0**

Mean for boys: **7.02284**

Mean for girls: **7.96193**

Source: ***Kenya National Examination Council (2011)***