

**SCHOOL FACTORS INFLUENCING ENROLMENT OF FEMALE  
STUDENTS IN PHYSICS IN PUBLIC SECONDARY SCHOOLS IN  
KISUMU DISTRICT, KENYA**

**Nyabengi Nyagaka James**

**A Research Report Project Submitted in Partial Fulfillment of the  
Requirements of the Degree of Master of Education in Curriculum  
Studies**

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## **DECLARATION**

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

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James Nyagaka Nyabengi.

E55/66082 /2011

This research report project has been submitted for examination with our Approval as university supervisors

---

Dr. Mercy Mugambi.

Lecturer

Department of Educational Administration and Planning

University of Nairobi

---

Mrs. Lucy W. Njagi

Lecturer

Department of Educational Administration and Planning

University of Nairobi

## **DEDICATION**

This project is dedicated to my dear wife Dinah Moraa for the inspiration she has continuously given me throughout the entire course. Secondly, it is dedicated to my children Job and Joshua for their endurance during my long absences as I pursued my studies at the University of Nairobi.

## ACKNOWLEDGMENTS

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## **ABBREVIATIONS AND ACRONYMS**

<b>BED</b>	Bachelor of Education
<b>B.O.G</b>	Board of Governors
<b>BSC</b>	Bachelor of Science
<b>DEO</b>	District Education Officer
<b>EFA</b>	Education for All
<b>FAWE</b>	Forum for African Women Educationalists
<b>KCSE</b>	Kenya Certificate of Secondary Education
<b>KNEC</b>	Kenya National Examination Council
<b>M.Ed</b>	Master of Education
<b>MDG</b>	Millennium Development Goals
<b>MOE</b>	Ministry of Education
<b>MOEST</b>	Ministry of Education Science and Technology
<b>PGDE</b>	Post Graduate Diploma in Education
<b>PHY</b>	Physics
<b>QASO</b>	Quality assurance and standards officer
<b>SCRE</b>	Scottish Council for Research in Education
<b>SMASE</b>	Strengthening of mathematics and Science in Secondary Schools
<b>STEM</b>	Science, Technology, Engineering and Mathematics
<b>UNESCO</b>	United Nations, Educational, Scientific and cultural organizations

## ABSTRACT

Women and girls in Kenya constitute more than 55 percent of the country's population and their full participation in science and technology at the leadership and research level is crucial for realization of Kenya development Vision 2030. In view of this, girls enrolment in physics nationally and particularly Kisumu district, is of a great concern since many girls will be technically not eligible for many university and polytechnic science courses where physics is a requirement. Therefore, this study was carried out to investigate the factors influencing girls' enrolment in physics in public secondary schools in Kisumu district. The study was guided by four research objectives which include: To determine extent to which teachers professional training influences girls enrolment in physics in Kisumu district, to examine the extent to which teaching and learning resources of physics influence girls enrolment in physics in Kisumu district, to examine how the attitude of students toward physics influences girls enrolment in physics in Kisumu district and to examine how guidance and counseling of students on career choice as influenced girls enrolment in physics in Kisumu district. The study employed cross-sectional descriptive survey design. To gather both qualitative and quantitative data. The research instrument used was questionnaires which had both closed ended questions and open ended questions. A sample of 20 schools, 20 headteachers, 24 physics teachers and 400 students were used in the study. Quantitative data and descriptive data were used to analyze and generate frequencies and percentages while qualitative data was analyzed according to themes and was converted into frequencies and percentages where necessary and also reported as a narrative. The study revealed that the professional training of teachers had no influence on students enrolment in physics since all teachers were trained to teach in secondary schools. Teaching and learning resources had no influence in physics enrolment since even those schools that had inadequate resources, the enrolment was still low. The study also revealed that girls' attitudes toward physics were positive. Career masters and the counseling departments were found to be very ineffective and had a great influence on girls low enrolment in physics. The researcher concluded that there was low enrolment of female students in physics in public secondary school in Kisumu District. The researcher recommended that more female teachers to be trained in physics in order to demystify the notion that physics is a male domain. The physical facilities in the district should match the number enrolled in the schools. Teachers should be trained in career choice not only in psychological counseling, counseling should be effective in the schools. A country wide research study on factors influencing girls' enrolment in physics is highly recommended.



## **CHAPTER ONE**

### **INTRODUCTION**

#### **1.1 Background to the study**

Education is a key determinant of improved well being of a society. Studies have revealed that in instances of improved education of women, there has been a negative relationship between increased education levels and other key human development indicators such as child mortality, maternal mortality, household nutrition and more directly household incomes. Investigating girls' opportunity for education and addressing systematic and other challenges that hinder their success and completion rates in efficient economic decision for any country United Nations, Educational, Scientific and Cultural Organization (UNESCO, 2007). It is because of this recognition of the benefits accrued from educating the women that the world has continued to boost significant resources over the years to expand access to women and girls at all levels of education. However, women's education still lags behind especially in the areas of science and technology (UNESCO, 2007).

The concern of low participation of girls in science and technology was noted in as far as back as 1976 when the National Commission on Education Objectives and Policies reported that, in Kenya the majority of educated women tended to go into nursing, secretarial and teaching careers. This committee recommended that this restrictive trend needed to be evaluated and desire ability of encouraging women to go into other careers be determined (Gachathi report, 1976). The UNESCO conference on higher education in the 21<sup>st</sup> century held in Paris in 1998 emphasized the need for women to have access to higher education



especially in areas of science and technology. Science and technology holds some of the important keys to development and unlocking Africa's resources thus improving the quality of life. Globally, women tend to be under presented in science and technology. This is partially due to choices they make at lower levels in their school education (Buguma & Muhairwe,1999).

A number of Kenyan women have been trained and are now working as medical doctors, agronomist, chemists, microbiologists, engineers, pharmacists, computer scientists, technicians researchers and teachers in science and technology fields unfortunately it appears that much still needs to be done in order to not only attract more Kenyan women to science and technology areas but also to achieve gender parity in all spheres (UNESCO, 2007). According to Mama (1996), democratic practice demands the involvement of both sexes in view of the fact that they constitute equal proportions of the population in most countries.

Obanda (1995) found out that even though there is no proven discrimination in enrolment in science and technology fields, the percentages of females enrolled is still lower than that of males. (Chege & Sifuna, 2006) in their analysis of 2004 students enrolment at the polytechnic by gender and departmental revealed that concentration of females was in business studies (55%) and institutional management (85%). in departments such as building and civil engineering and mechanical engineering, female representation was particularly low – comprising of only 6.3 %, 3.4 % and 2.7% of the student population respectively. In cognizance of this situation, Mwayuli ( 2008) in a paper presented at the 14<sup>th</sup> international conference of women engineers and scientists in France, suggested that Kenya women scientists and engineers through well

coordinated networks should come out strongly to change societal attitudes , influence policy, mentor and empower young girls to get into science and engineering.

The attempts to increase opportunities for women and girls in science and technology have led to many educational policies formulations. However the commitment to translate this priority into action has remained problematic for many schools as they lack the required human and material resources. In addition even where we have professional teachers, availability of resources, and proper allocation of time, guidance and counseling of career choice still we have low enrolment of female in physics (UNESCO, 2003).

Following the Jomtien (Thailand) declaration on education for all (EFA) UNESCO (2007) to which Kenya is a signatory, various national conferences, were organized. (Chege & Sifuna, 2006), in terms of improving girls performance in Science, Technology, Engineering and Mathematics (STEM) subjects, the Machakos symposium recommended that efforts to be made to equitably distribute science equipment to girls and mixed secondary schools at a ratio of 1:2. This meant that for every item given to girls and mixed schools. Evidently much as been done internationally and at national level to increase opportunities for women and girls in science, mathematics and technical subjects. Reasons why girls fail to pursue science courses in large numbers range from : poor performance at KCSE level, science courses not in line with their preferred careers. (Ogeto, 2008) noted that many girls aspire to join national public universities after their secondary education; however due to stiff competition for the few available places, majority can only be absorbed in various national and

regional tertiary colleges, most of tertiary colleges offer sciences oriented courses, where many girls are technically locked out due to poor performance in mathematics or having not done physics which is a requirement in many technology and engineering courses.

**Table 1.1**

**Statistics on KCSE performance in sciences per gender from 2009 to 2011**

<b>Year</b>	<b>Gender</b>	<b>Biology</b>	<b>Physics</b>	<b>Chemistry</b>	<b>Total</b>
2009	Female	97641	60960	99558	214159
	Mean	45.49	9.92	46.49	100
	Male	103156	43116	114962	261234
	Mean	39.49	16.50	44.00	100
2010	Female	113605	15288	120826	249719
	Mean	45.55	6.12	48.38	100
	Male	131370	50136	126684	308190
	Mean	33.47	15.88	50.64	100
2011	Female	106865	14365	123841	245071
	Mean	43.61	5.86	50.53	100
	Male	109863	52125	166201	328189
	Mean	33.47	15.88	50.64	100

**Source: KNEC 2011**

From Table 1.1 it can be noted that the students attracted to other science subjects is overwhelming regardless of gender. This trend has persisted over the three year span. However, physics is less popular to both boys and girls but with great enrolment disparities between gender. The number of girls enrolled each

year in physics has remained less than half the number of boys. Most worrying is that the enrolment of girls in physics is decreasing while that of boys is increasing hence this study. In view of this statistical data, one need for a multifaceted approach to address the low presentation of women and girls in science, technology, engineering and mathematics courses is still low.

Ministry of Education (2011) noted that most factors influencing the choice of these subjects maybe universal in all regions but some regional unique factors cannot be ruled out. For instance Ministry of Planning and National Development (2002) reported that in Kisumu district, gender inequality is deeply rooted on cultural and traditional values which prescribed roles based on sex is a common phenomenon. Many girls in the district are encouraged to do what they believe is feminine jobs like teaching, secretarial but not engineering or architecture which is known for men.

This study was on school factors influencing enrolment of female students in physics to determine whether professional qualifications, students' attitude towards physics has any influence on enrolment of girls in physics. According to Angora (2003) who studied on factors to poor performance in physics, noted that professional qualification has got no influence on enrolment or performance in physics. He further noted that the students attitude towards the subject determine their enrolment and performance in that subject.

The study on school factors influencing enrolment of female students in physics was also to determine whether guidance and counseling on career choice and availability of teaching and learning resources has got any influence in girl's enrolment in physics. According to Gacarira (2007) who was studying on factors influencing choice between physics and other subjects noted that teaching and learning resources has got no influence in the enrolment of a subject but the guidance and counseling has great influence in the enrolment of a subject and the time allocated in teaching it. From table 1.1 it can also be noted that girls performed better in other science subjects especially Chemistry which had an upward trend. In Biology the girls did better than boys or at par. This was not the case with Physics where boys performed better than girls. There was a downward trend in performance of girls hence this study.

Table 1.2 shows enrolment of science subjects in KSCE for 2010 to 2012 in Kisumu District.

**Table 1.2**

**Statistical on KCSE enrolment in sciences in Kisumu district**

Year	Total candidature		Physics		Biology		Chemistry	
	in Sciences		candidature		candidature		candidature	
	girls	boys	girls	boys	girls	boys	girls	boys
2010	5353	6226	510	1213	2247	2095	2596	2897
2011	5599	6298	508	1250	2470	2116	2621	2930
2012	5984	7217	503	1332	2671	2590	2810	3295

**Source: DEO Kisumu district 2010-2012**

It is quite evident from the Table 1.2 that alarming small number of girls enroll in physics each year. For instance out of 5984 candidates who enrolled in science in 2012 only 503 girls enrolled in physics.

## **1.2 Statement of the problem**

Women and girls in Kenya constitute more than 55 percent of the country's population. Their full participation in science and technology at leadership and research level is crucial for realization of Kenya Development Vision 2030 (Njuguna, 2009). In view of this, girls' low enrolment in physics nationally and in particular Kisumu district is of great concern since many girls will be technically not eligible for many University and polytechnic science courses where physics is a requirement.

Both girls and boys enroll in biology and chemistry in large numbers. However without physics their possible chances of pursuing STEM (Science, Technology Engineering and Mathematics) courses in higher education are greatly narrowed. The problem to student's performance in sciences and low enrolment in physics has attracted many researchers. Studies by Orodho (1996), Angora (2003), Ogeto (2008), Njiru (2007) mainly focused on identifying factors hindering achievement in science subjects among boys and girls and not specifically in physics.

The studies however did not touch on the issue of gender differentials in both performance and enrolment. Kereria (2007) investigated the factors

influencing form two students in their choices of all optional subjects. However, the study did not single out girl's enrolment and particularly in physics. Kagema (2005) did a study on low enrolment in physics in secondary schools in Maragua district. The study dwelt on Physics enrolment and not specifically on girls hence this study. Studies specifically done on girls low enrolment in physics includes those done by Musyoka (2000), Munguti (2004), Munyalo (2006, Gacarira (2007) and Njuguna (2009). Most of these studies, have identified the effects of coeducation, lack of role models and peer influence as some of the hindrance to girls participation in physics. Even though research has been done on low girls' enrolment in Physics by many researchers, there is no research that has been done in Kisumu district. Hence, this study.

The studies came up with many recommendations aimed at increasing the number of girls in physics. Following these recommendations single sex schools are on increase in the country and many girls' schools have benefited from government provision of laboratory equipment (Chege & Sifuna 2006). However, with all this pro-active measures not withstanding the issue of girls' low enrolment in physics still persists nationwide (KNEC, 2011). The low enrolment happens inspite of the schools being not only single sex but endowed with adequate teaching and learning resources. (Ogeto, 2008) More studies have not tackled crucial issues which this study is going to use like guidance and counseling of career choice.

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

The purpose of the study was to investigate the factors influencing enrolment of female students in physics in secondary schools in Kisumu district, Kenya.

### **1.4 Objectives of the study**

The study was guided by the following objectives.

- i. To determine extent to which teachers professional training influences girls' enrolment in physics in Kisumu district.
- ii. To examine the extent to which teaching and learning resources in physics influences girls' enrolment in physics in Kisumu district.
- iii. To examine ways in which the attitude of students towards physics influences girls' enrolment in physics in Kisumu district.
- iv. To examine ways in which guidance and counseling of students on career choice has influenced girls' enrolment in physics in Kisumu district.

### **1.5 Research questions**

The study was guided by the following research questions.

- i. To what extent does teacher's professional training influence girls' enrolment in physics in Kisumu district?
- ii. To what extent does the availability and adequacy of teaching and learning resources of physics influence the girls' enrolment in physics in Kisumu district?



- iii. In what ways does the attitude of students' towards physics influence the girls enrolment in Kisumu district?
- iv. In what ways does guidance and counseling of career choice influence the enrolment of girls in physics in Kisumu district?

### **1.6 Significance of the study**

The findings of the study may assist policy makers to make decisions on what to do on gender differences in enrolment in secondary schools especially science subjects. The findings may help the school administrators to identify areas of weakness in enrolment in physics and address them to avoid low enrolment. The study also may help quality assurance and standard officers to advice teachers on how to improve enrolment in science. The findings may help girls change their attitudes on physics and break the yoke of subjugation placed on women by the society for ages. The findings may also help the guidance and counseling department on career choice to identify areas of weakness and make some improvement.

### **1.7 Limitations of the study**

The main limitation of the study was lack of awareness among the students in relation to the key variables of the research .To mitigate on this , the researcher ensured that instrument items are clear on the information needed.

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

This study was conducted in Kisumu district in Kisumu County because it has secondary schools of different categories with high student populations. The respondents were drawn from headteachers because they are in charge of their schools, physics teachers and from form three and four students. The physics teachers were at a position to tell on student enrolment and form three and four students will have selected the subjects.

### **1.9. Assumptions of the study**

The following were the assumptions of the study:-

- i. The respondents provided their response to the items in the study
- ii. The selected schools provided the required information to address the research problem adequately
- iii. The physics teachers were aware and familiar with physics enrolment in secondary schools in KCSE in Kisumu district.

### **1.10. Definitions of significant terms**

The following are the significant terms that were used in the study

**Affirmative action** refers to the practice of the principles treating disadvantaged groups of people favorably in order to bring them to the same level with the rest.

**Attitude** refers to sum total of one's feelings, bias and pre-conceived convictions

**Co-educational schools** refers to schools where boys and girls learn together

**Counseling** refers to making a student to understand the importance of taking a particular subject.

**Enrolment** refers to the act of making someone officially a member of a group, society or institution by registration

**Guidance** refers to giving a direction on the right action to be taken in an issue.

**Teachers' professional training** refers to getting the require skills and knowledge on a specialized area (subject).

**School factors** refers to all the activities done in school either socially, economically or politically and their influent to the students.

**Stereotype** refers to a fixed set of ideas about what a particular type of person is likely or should do, for instance girls are taken to be only good in teaching, nursing, secretarial and not engineering, architecture, masonry among others.

**Teaching and learning resources** refer to laboratories, classrooms, practical apparatus to be used in teaching and learning process.

**Motivation** refers to a force to perform an act or engage in an action or actions.

**Valency** is the degree of which objects are described or reflected by individuals.

**Expectancy** is a momentary belief concerning the probability that a particular outcome or set of outcomes will follow a particular action that ranges from strength of certainty will result in the outcome.

**Instrumentality** is the expected utility or usefulness of a direct outcome of the attained or avoided motivation and attentiveness of the subject in order to enroll in physics.

**Guidance** is the process of helping individuals to understand themselves and the world.

**Counseling** is educational activities and services aimed at assisting individuals achieve desired goals in life.

**Physical facilities** include laboratories, extra rooms, electricity, water supply and text books.

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

The study is organized into five chapters. Chapter One of the study comprises of general introduction which contains background to the problem, statement of the problem, purpose of the study, objectives of the study, research questions and significant of the study which gives the relevance of the study. It also deals with limitations and delimitations of the study. The Second Chapter focused on literature review which was divided into sections: introduction, role of teachers, teaching learning resources, teacher and learners attitude towards physics and role of guidance and counseling in career choice. The literature review focused on theoretical framework, conceptual framework and summary of reviewed literature. The Third Chapter focused on; introduction, research design, target population, small size and sampling procedures and data analysis techniques. The Fourth Chapter comprises of presentation of analysis and interpretation and discussions. Lastly Chapter Five focuses on summary of findings, conclusions, and recommendations.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

This chapter reviewed the related literature to the study. This chapter consists of nine sub-headings. The teachers professional and professionalism, teaching learning resources, teachers and students attitudes towards physics and role of guidance and counseling in career choice. Theoretical bases of the study, the conceptual framework and summary of the reviewed literature is also in this section.

#### **2.2 Women and Technology Development in Africa**

Women in Africa constitute more than 50% of the continent's population (UNESCO, 2006). Thus, their full participation in science and technology at leadership and research levels is crucial for the rapid industrialization of the continent. This goal can only be achieved if girls embrace and excel in subjects, which will eventually enable them engage in science and technology.

The application of science and technology in Africa remains a major challenge even after numerous attempts to implement strategies for the promotion of a science led modernization of all economic sectors Odhiambo and Isoum (2008). Salam (1990) who was then the president of Third World Academy of science noted that the ability to merge science, technology and development at the practical level may be attributed to the many complex socio cultural, economic

and political factors that have influenced the cause of events since 1960s. These factors coupled with a series of natural disasters such as droughts have precipitated what has come to be known as the “crisis” that continues to the present day.

While developing countries in Asia and Latin America forge ahead in the use of science and technology to modernize their economies, and compete successfully with developed countries, many countries in Africa still fall into the category of the least developed, characterized by a low level of scientific and technological development (Wasanga, 1977).

Many development experts believe that one of the most essential steps to be taken towards revitalization of science is the building of indigenous capacities to manage rapid scientific and technology change and to devise long-term strategies for science led development (Odhiambo & Iboum (2008). This means priority must be given to the generation of human resources to direct the scientific endeavours towards a total social-economic transformation not only in terms of industrialization, but also in terms of the provision of basic needs and the improvement of quality life of the majority of Africa’s people.

In Africa, where 70% and 80% of the population resides in rural areas, successful application of science and technology to development will be measured in terms of the extent of an improvement of the quality of life of the majority of the population. Improvement

in food production, nutrition and health, education services, the arrest and reversal of the environmental degradation which has become a widespread phenomenon on the continent (Makhubu, 2004).

It is in this context that the role of women in the scientific development of the continent is considered and seen as a critical means of building and strengthening the continent's scientific capacity. Mobilizing this group, whose perceptions of the problem are unique, may add dimensions to development hitherto unforeseen. Makhubu (2004) observed that women in Africa constitute roughly 51% of the population and their significant under representation in science and technology at leadership and research levels deprives the continent of a substantial input. This deprivation amounts to a neglect of over 40 percent of the human potential, which the continent can ill afford, especially at this time.

In developed countries women and girls have made great strides in the field of science and technology. According to Whittock (2002), there were many women who are now working as computer engineers, soil and water specialists, doctors, applied biology experts, chemical analysts, pharmacists, electrical and electronic engineers. However their number compared to men is still lower.

Maria (2008) while working with information for a choice (IFAC) in Europe, a project for empowering young women through learning for technical profession and science career, conducted a study which came up with several findings. She found that because of rapid technological changes and globalization,

both girls and boys opt for scientific and technological subjects in order to secure for their “employee ability”. However, although girls are considered to perform better during and after the end of their initial education, more boys than girls will follow higher education studies in science and technology and even fewer will follow a career in STEM (Science, Technology, Engineering, and Mathematics). She further noted that while women are not formally excluded from any level of education, nevertheless social stereotypes and traditional concepts for women’s create a status of informal exclusion of girls, thus guiding them to making different educational and professional choices than those of boys.

Additionally despite the increasing demand for qualified personnel in research and technology and despite the high rate of women graduates from high education, women are still under-represented in science and technology and are highly employed in traditional sectors such as teaching, nursing, secretarial and many office jobs.

Maria (2008) also noted that the highest concentration of women in the field of research and industry is found in biology, health services, pharmaceutical companies where there is very low representation in sciences like physics, information technology and engineering. Among the 30 organization for Economic Co-operation and Development (OECD) member’s states, approximately 50% of tertiary education graduates are women; but only 30% are in (STEM). Girls, even when they perform better than boys, do not opt to follow a career in STEM. The reasons for that are numerous and the situation that has



developed cannot change unless the barriers are unveiled, especially the long established stereotypes and the lack of accurate information (Maria 2008).

To date women have done exceedingly well in the developed countries. Many women hold positions, but often these are in service organizations. It is not enough to have a prime minister, although that is a great achievement when all major decision bodies, wherever they may exist, have roughly 50 percent female representation, then there is a great probability that decisions taken may ultimately be more humane. In no area does this situation strike one as much as in physical sciences and in technology, which are changing the world. Women's participation in these areas is still minimal, but the capacity for world destruction in these areas is enormous, more women must gain access to knowledge in science and technology (Tilghman, 1993).

The first African union conference of African Women in Science and Technology was convened by the African Union Commission (AUC) in Johannesburg, Republic of South Africa in August (2007). The meeting noted that in Africa, 50% of the population are women and are seriously under-represented in science, mathematics and engineering fields and yet they are a resource that could contribute towards the social and economic development of the continent through participating in science and technology programmes (AUC, 2007).

In cognizance of the critical roles that science and technology play in social and economic development of the continent; competitiveness and its

integration into the global economy, and achieving the Millennium Development Goals (MDGs), the participating women committed themselves to:-

- a) Increase visibility and solidarity of women in science and technology by creating portals (database on women in science and technology, intellectual property issues, best practices, success stories, best publications, career guidance, mentoring programmes among others) through the support of our Regional Communities, Members States, and Development Partners.
- b) Empowering women in rural areas by promoting experience sharing meetings, for a, workshops between rural women and women in science and technology, including indigenous knowledge systems.
- c) To find a mechanism to bring together women in science and technology that coordinates their science and technology initiatives and encourages scientific cooperation, networking and collaboration amongst women in science and technology and recommend that the proposed adhoc committee by the conference as an interim arrangement will work out the modalities of this mechanism within six months.
- d) Identify, document and share success stories from other AU (African Union) member states that have achieved gender parity and have even more women than men in science and technology for possible replication by other member states lagging behind.

- e) Devote time to role-model the young ones by going to institutions of learning to show case their success in science and technology offer career guidance and interact with young girls in science and technology.

Source: retrieved January 8, 2014 from [http://www.nepads.org/doclibrary/pdfs/amcest3\\_09\\_Nov\\_2007.pdf](http://www.nepads.org/doclibrary/pdfs/amcest3_09_Nov_2007.pdf).

The participants also recommended the following for African Ministers (Cabinet Secretaries) for Science and Technology:

- i. Build the capacity of media institutions and practitioners to promote the outreach and community awareness on science and technology programs among women.
- ii. Lobby and advocate to get more women in strategic, policy and decision-making positions to facilitate and accelerate the implementation of science and technology programs for women.
- iii. Promote strategic partnership mechanisms with developed countries, international organizations and the Diaspora to support science education in Africa beyond the graduate level especially targeting women.
- iv. Forge structures to facilitate technology and knowledge acquisition and transfer and initiate productive result oriented partnerships and links between researchers, society and industry to promote suitable

rollout of research products with economic-value into the market help stimulate women technopreneurships.

- v. Promote the establishment of technology incubators and introduce and expand formal and non-formal entrepreneurship training and requisite facilities.
- vi. Create an innovation fund (Venture Capital) for women entrepreneurs in Science and Technology to encourage the development of small business through favourable fiscal incentives for women entrepreneurs.
- vii. The African Union (AU) programme on Science, Technology and Innovation Statistical Indicators should be gender disaggregated and include science education from primary and secondary levels to facilitate sound decision-making with regard to women and science education.
- viii. The commission of the all in collaboration with UNESCO should establish scientific chairs for women and define role to play.
- ix. Honour women in various clusters of science and technology.

Source: retrieved January 8, 2014 from [http://www.nepads.org/doclibrary/pdfs/amcest3\\_09\\_Nov\\_2007.pdf](http://www.nepads.org/doclibrary/pdfs/amcest3_09_Nov_2007.pdf).

These were very crucial commitments and recommendations which although most of them have not been realized some have been put into practice with far reaching positive effects.

In Kenya, according to MOEST (2003) report, reasons for women low enrolment in science and technology are many and varied. Possible reasons include the traditional gender stereotypes of desired male and female occupations, the macho environment of vocational trades and parents attitudes towards girl vocational training.

Apart from mathematics which is compulsory all secondary students in Kenya, physics knowledge is proving to be of invaluable applications in the wake of modern gadgets such as computers, electric heaters, juicers, hairdressers and hot water systems in bathrooms to sexual gratification gadgets. Many people have been reported killed in kitchen and bathrooms due to electrocutions. Thus, it is imperative that all people, if possible should be equipped with the physics knowledge.

According to UNESCO (2006), many women fail to participate in science and technology, fail to take science courses such as engineering due to inadequate knowledge and confidence in mathematics and physics among other reasons. The current study sought to establish whether inadequate knowledge, confidence and altitude in physics do influence girls enrolment in public schools in Kisumu District Kenya.

### **2.3. Teachers' professional training in relation to girls' enrolment in physics**

The teachers are the one who impact knowledge and skills to the learners, observes that the learners do the right thing. Shiundu & Omulando (1992) noted

that the teachers should teach, guide and administer the class to enhance curriculum implementation. The teachers therefore require appropriate and relevant training to be able to teach. He /she should choose learning experiences and teaching methods to make the subject simpler and attractive to the learners. Ogeto (2008) postulates that training of teachers is mainly attached to one's qualifications and goes along way equipping teachers with skills to enable them implement curriculum. Ornstein and Njira ( 2007) says that the teachers are virtually untapped sources of energy and insight that are capable of changing the school if they act as a group and direct their energy to the learners and guiding them to the importance of the subject in their lives. The enrolment of physics will be successful when the teacher uses efficiently the professional skills to implement the physics curriculum. The teacher training equips the teacher with the necessary skills to be flexible in teaching situation. Retraining is required for teachers to be able to handle the several changes introduced to the physics curriculum effectively; teachers need appropriate and relevant training to be able to handle curriculum implementation. Teachers must be learners throughout their professional lines (Kagama, 2005)

Teachers are the main agents of enrollment in Physics subject Angora, (2003) and Hawes (1978) noted that the teacher requires an adequate pre-service and in-service training to be able to handle curriculum implementation effectively and efficiently. Kagema (2005) noted that if teachers are not adequately prepared they will face some difficulties in curriculum implementation and hence few

learners will be attracted to enroll in the subject. Ogeto (2008) states the teacher has a leading and important role to play in the enrolment of the learners.

Gacarira (2007) noted that the teacher needs to be as pre-serviced on how to influence learners to take physics as one of the elective subjects. The government has pursued this view but emphasized on training science teachers through Strengthening of Mathematics and Science in Secondary Schools (SMASE).

#### **2.4 Availability of teaching and learning resources as related to girls' enrolment in physics**

Teaching/learning resources are vital in any meaningful system of education. These materials would include books, laboratories, mass media programmes and syllabus to help teachers to impart the real knowledge. Angora (2003) observed that if any meaning of implementation of a curriculum should take place, there should be ready and continuous supply of teaching learning resources. Munyalo (2006) studied the factors influencing the choice of physics and has revealed that teaching and learning resources play a vital role in learning and enrolment of learners in that particular subject. Ogeto (2008) stated the use of instructional resources in secondary schools in Kenya and revealed that teaching and learning resources play a vital role in learning process. It has been proven to have an advantage if used properly. Non print resources like video tapes, real objects, slides and films as well as resource persons can play an important role in the enrolment of physics. Munyalo (2006), who explored the availability of

audiovisual in teaching and learning as important in curriculum implementation. According to Ministry of Education Science and Technology (MOEST, 2004) stressed that availability of resources motivates both teachers and students in their enrolment. Mostly physics enrolment depends on adequate class text books, revision books, spacious rooms for practical activities and group discussions.

Teaching learning resources are key in the effective delivery of the curriculum (Ministry of Education, 2007). In addition absence of learning materials in classes will be teacher centered and students will not have interest towards the subject. Learning materials are critical inputs in the teaching since they assist learners to synthesize what is learnt (Musyoka, 2000).

Njuguna, (2009) found out that even schools where resources are available and not used effectively the enrolment is low. This proves that the resources are directly related to effective enrolment if we expect physics as a subject to enroll more students and perform well.

## **2.5 Students' attitude towards physics and girls' enrollment in physics**

Kagama (2005) contends that the key determinants of students' attitudes to physics are how students see themselves in relation to the subject, both now and in the future; their "physics self-concept", their experience of school physics and personally supportive physics teacher.

Results from national assessment of Educational performance (NAEP) studies in the United States of America (W) revealed consistent decline in



attitudes towards science from earlier to later grades in school (Ogeto, 2008). Ogeto's study, based on interviews with 149 students from elementary, junior and senior high schools concluded that children at the beginning of their schooling liked science. However, in high school, increasing alienation resulting from the growing obstruction and complexity of science classes emerged clearly as a negative influence on attitude: many students reported that they were no longer able to understand science. They no longer enjoyed it and would not pursue it any longer or consider it as a career.

Other studies from Britain and Germany have also found the same trend on students declining interest in sciences although the age at which this begins is not consistent across the studies. Njuguna, (2009) suggested that it might reflect that the decline is not linear and is more dramatic past 14 years, particularly for some girls. According to (Ogeto, 2008). It can be concluded that overall, both boys' and girls' interest in science declines across the phases of schooling. The decline in interest may begin for some students in primary school and increases past 14 years, particularly for some girls and particularly in physics. For some girls the decline is linked to their increasing feeling of not being good at the subject (that is their sense of self efficacy). This in turn leads them increasingly to experience physics as difficulty. Students' enjoyment and liking the subject are reported to be very significant factors in course choice by students and teachers alike. Some studies have examined the nature of the course that increases students' motivation to engage with physics.

Njira, (2007) noted that in Scotland in contrast with the rest of the UK and other countries, physics is the fourth popular subject at a Higher Grade, which students take at age 18. They inferred from this that the prior physics course determines the grade standard, which students take at the age of 16. This was successful in engaging and retaining students' interest in physics. Thus prior achievement is a significant influence on students' course choice in school. Students even if they are interested in the subject, need to feel that they can do physics and thus may be more significant for girls than for boys. Some studies found that some girls, as they continued with their study in physics, their self concept in relation to it decline (Musyoka 2000).

Angora (2003) found that the majority of the students who were not taking physics were scared by its quantitative nature and its being too abstract especially when it is taught theoretically. He recommended a change in the approach to teaching of physics and proper curriculum guidance in schools. He further noted that to maintain girls' and boys' interest and motivation to study physics is important that they experience themselves as competent learners of physics. Students need to feel that they can do physics if they are to decide to continue to study it, and this is particularly true for girls.

Mwanyuli (2008) noted that the achievements of students in lower quartile did not depend on attitude, whereas the achievement and attitude in upper quartile had a positive correlation. Therefore, for a good performance in physics, positive attitude is necessary but poor performance; negative attitude may not be the main

cause. He recommended that students should be assisted to develop self-confidence, particularly girls towards physics and science subjects in general. In addition, teachers should give positive encouragement even to low achievers during the teaching-learning encounters. However, Munguti (2009) did not establish the possible link between the students' attitudes and the impact on enrollment. The current study sought to establish the influence of the attitude on enrolment in physics.

### **2.7 Career master and counseling in relation to girls' enrolment in physics**

Guidance and counseling programmes is one of the most important components of the school curricular activities. According to Handbook for School Guidance Counsellors (MOE, 2003), guidance is a process through which the individual is helped to develop his mental abilities, aptitudes, interests and personal dynamics. Counseling on the other hand is a process of the relationship between a counselor and a client or counselee with a view of helping the counselee to understand his or her problems in relation to his or her thoughts, feelings and behavior in order to make informed choices of action.

Vocational guidance and counseling is a component of guidance and counseling programme, which lays emphasis on participations economic and social value. It assists the consumers (students) in exploring available training occupations, as well as gain insight into the world of work and acquires the value and dignity of work (Makinde, 2007). Therefore lack of it undermines the

economic productivity of the country due to lack of proper career preparation, training and satisfaction.

Guidance and counseling primarily developed from vocational guidance, which was the sole concern of counseling psychology in the late 1890s and early 1900s (Friedenberg 1995). Smith (1951) reported that as early as 1895, a systematic vocational guidance, and counseling programme had developed at California school of mechanical arts in San Francisco. As a school principal in California, Jesse B. David spent most of his time counseling boys and girls on educational and vocational problems (Smith, 1951). He even introduced a vocational guidance and counseling lesson on the timetable. In 1958, the USA Education Act was passed and among other items, guidance and counseling and training initiatives by universities to prepare school counselors were strengthened. It was from the USA that guidance and counseling spread to other countries such as Britain and Japan.

Makinde (2007) traces modern guidance and counseling in Africa in Nigeria in 1959. At this time the Catholic Sisters at St. Theresa College in Ibadan began organizing formal career guidance services for upper class students, a few days before school certificate examination. During these activities emphasis was laid on vocational, awareness about the world of work, location of employment, and reduction of anxiety when taking examinations.

In Kenya, vocational guidance and counseling started taking shape in early 1960s on realization that the new young nation needed to prepare itself for rapid manpower development. In 1962 the Ministry of Labour in conjunction with the Ministry of Education decided to provide vocational and counseling services to workers as well as school pupils with the help of career masters. In 1970, a career guidance handbook to aid secondary school leavers was produced and subsequently the MOE established a guidance and counseling section with the main purpose of dealing with educational guidance and counseling in schools. However the teachers assigned the counseling services had no training in counseling. According to the handbook in Counseling and Guidance Counsellors (1977), a teacher counselor was expected; to have sincere interest in each students development, be committed to the cause, be a good public relation person, mature and must have initiative and good judgment.

The Gachathi Report on the National Educational Objectives and Policies of 1976 emphasized the importance of guidance and counseling in the education system, particularly because of its role in the totality of the growth and development of the youth. The report further stressed that guidance and counseling should aim at reducing conflict between students and their parents regarding choice of education and various careers.

To equip the teacher counselor with professional expertise, the report recommended establishment of guidance and counseling courses of university of Nairobi. This recommendation has so far been implemented by establishing a

certificate, diploma and degree courses in guidance and counseling in the Department of Extra Mural Studies, Faculty of External Studies of University of Nairobi.

However, inspite of the numerous recommendations and efforts to firmly institutionalize guidance and counseling in schools. Teachers Service Commission which has the sole mandate of employing teachers in Kenya seemed to relegate this part of curriculum to periphery. This was to change when schools were engulfed by students' strikes in late 1990s. Keriria (2007) in a report published in East African Standard, argued that guidance and counseling was the missing link in the management of many schools. The report recommended the use of guidance and counseling to reduce cases of students' riots, truancy, apathy and low performance. A similar recommendation was given by the Wangui Report (2001) which was a task force on students discipline and unrest in secondary schools. In reaction to this the Teachers Service Commission has since 2001 been posting trained personnel in guidance and counseling in secondary schools. However the teachers are very few to cater for all schools in the country. Further, the teachers might concentrate on curbing indiscipline among students and thus neglecting the other important, component, the career guidance and counseling.

The Koech Report (1999) noted that Kenyan Institutions of Learning have failed to inculcate positive attitudes towards work, and recommended a redesigning of the institution approach with a view of improving this situation

compounding to the overall problem of unemployment, laxity and poor performance in both public and private sectors in the country.

Lack of professionalism and non-adherence to Kenyan workforce. A scrutiny into this situation gives indication that there may be an underlying fundamental problem of lack of proper vocational or career guidance and counseling. Makinde (2007), points out that guidance and counseling in Africa will bear fruits only if focuses on educational, vocational and career planning skills, among other things.

In order for career guidance and counseling to make a significant contribution, it must impart a significant high level of career awareness, which will lead to appropriate career planning and decision making. Wasanga (1997) found that students who received an attributional retraining treatment exhibited significant changes in their career beliefs and career exploration behaviors. Hence, career guidance and counseling leads to a deeper and wider understanding of one's personality and world of careers.

In today's world, youth are at crossroad educationally, socially, economically, and in relation to work. There are many challenges facing them in the society and this completely requires proper guidance (Makinde, 2007). These prevailing challenges are educational, cultural, economic and personal in nature. In addition, globalization and the continued rising of competitiveness are major challenges for the youth today. As such provision of guidance and counseling in

educational institutions is a vital tool that students can use to sort out and order their views and decisions about their intended careers.

In her study on the effects of guidance and counseling on students academic achievement, Mmbone (2008), found that just as much as counseling has a positive effects on the areas of academic performance, it was also found to help the learners in choosing their careers, improve students discipline and curbs students unrest in schools.

Therefore, in an effort to: inculcate students with the school and societal acceptable norms and behaviours, provide students with spiritual guidance and as a result to perform well in examinations; the career guidance and counseling has been neglected in many schools. It is possible that many guidance and counseling teachers are not well knowledgeable in career guidance. An effective career counselor should read widely to keep abreast with the constantly changing career, labour and employment sub-sector. For instance a career counselor should be able to comprehensively explain how the various cluster subjects will determine the courses students can take at university level.

In a study done by Mmbone (2008), students were asked to list down the issues that required the attention of the school counselor. The following were the main responses; boy and girl relationship HIV/AIDS issues, teenage pregnancy, adolescents experiences such as physical, emotional and psychological changes, drugs abuse, self awareness and general hygiene. All these enumerated issues are



important, however, it is significant to note that many students do not regard career guidance and counseling as an issue which can require the intervention of the school counselor. It is in view of this that the researcher embarked to find out the influence of career guidance and counseling on physics enrolment by girls in Kisumu District.

## **2.8 Summary of Literature Review**

The researcher reviewed literature on the women and technology development in Africa. The researcher reviewed the numerous attempts to implement strategies for the promotion of a science led modernization of all economic sectors. The researcher also reviewed the developed and underdeveloped countries on how women and girls have made strides in the field of science and technology.

The researcher reviewed literature on teacher professional training in relation to girls' enrolment in Physics. The researcher noted that teachers are the main agents of enrolment in any particular subject. The teacher also requires an adequate pre-service and in-service training to be able to handle curriculum implementation effectively and efficiently. The researcher also reviewed literature on the availability of teaching and learning resources as revealed to girls' enrolment in Physics. The researcher noted that resources are key in effective delivery of the curriculum. The absence of teaching and learning materials leads to teacher centred and makes the students lack interest in the subject.

The researcher reviewed literature on the students' attitudes towards Physics and girls' enrolment in Physics. Lastly, the researcher viewed the role of career masters and counseling schools and the role they play in the enrolment of subjects.

### **2.9 Theoretical Framework related to girls' enrolment in physics**

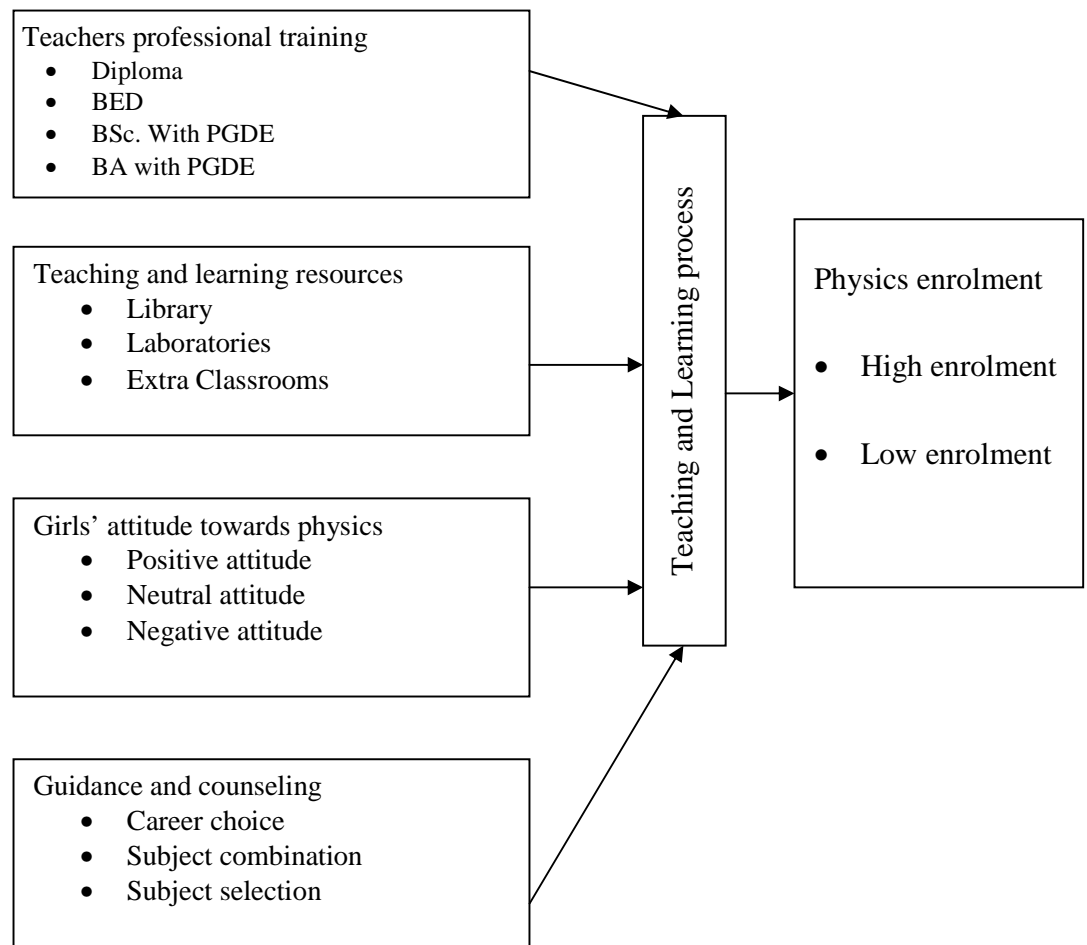
The study is based on the social learning theory by Albert Bandura (1977). Social learning suggests how a combination of environmental (social and psychological) factors influence behaviour. The theory outlines three requirements for people to learn and model behaviour: Attention, retention (remembering what one observed), reproduction (ability to produce the behaviour), and motivation, (good reason).

People learn how to behave through overt reinforcement or punishment or via observational learning of the social factors in their environment through four main states: imitation, close contact, imitation of supervisors, understanding of concepts and role model behaviour. Children acquire their knowledge and mental baggage of gender-typed behaviour by observing parents, teachers and other children. Whether the child imitates this behaviour depends on whether or not she has observed that the specific behaviour is rewarded when it is performed by someone else or her own sex. These behaviours are derived from everyday images, assumptions and language emphasizing differences between men and women. The socialization process eventually influences girls' performance and their interest in physics as a subject.

Stereotypes within the curriculum within the society that creates male or female subjects as they are accepted and taken for granted, resulting in sex-linked differences in participation and performance in school. The teachers perpetuates the same by using harsh pedagogical practices, hence the need for this research.

### **2.10 Conceptual framework**

According to Kombo and Tromp (2006), a conceptual framework is a research tool that assists a researcher to develop awareness and understanding of the situation under scrutiny and communicate them from the researcher's point of view. The conceptual framework shows the interrelatedness between various factors thought to influence the enrolment of girls in public secondary schools in Kisumu district.



**Figure 2.1**  
**Factors that influence enrolment of female students in physics**

The conceptual framework shows the input which shows the independent variables, the process explaining measures that should be put in place to influence female enrolment in physics in Kisumu district.

## **CHAPTER THREE**

### **RESEARCH METHODOLOGY**

#### **3.1 Introduction**

This chapter consists of methodology used to carry out the study. It is subdivided into the research design, target population and sampling procedures, research instruments, the reliability and validity of research instruments, data collection and data analysis procedures.

#### **3.2. Research design**

The research was conducted using descriptive survey. Mugenda and Mugenda (2003) defines a descriptive survey as an attempt to collect data from members of population in order to determine the correct status of that population with respect to one or more variables. Descriptive survey research requires correction of quantitative information from the sample. According to Angola (2003) descriptive research is concerned with conditions that already exist, practices that are held, processes that are on going and trends that are developing. Descriptive survey research is most appropriate when the purpose of the study is to create a detailed description of an issue (Mugenda and Mugenda, 2003). The study of school factors influencing enrolment of female students is practiced and this condition already exists making the designing appropriate for this study.

#### **3.3. Target population**

Kombo and Tromp (2006) define target population as a group of one or more common characteristics that are of interest to the researcher. The researcher

targeted 100 public schools in Kisumu District. According to the District Education Office Kisumu district 2013, there are 120 Physics teachers in the district with the enrolment of 4000 students in form three and four falling under the study population.

### **3.4. Sample size and sampling procedure**

Gay (1992) noted that for a large population, a sample size of 10 per cent to 20 percent of the population is a good presentation. A stratified random sampling technique of stratifying the population was employed to select sample size. This ensured that different groups of population were represented, the population was divided into strata of form three and form four. The researcher drew a sample of target population into a number of categories. Mugenda and Mugenda 2003 say 10 to 20 percent of the accessible population is enough for the descriptive studies. The sample strata had an equal number of form three and four. The physics teachers and Headteachers were not sampled.

Using Mugenda and Mugenda's suggestion, the researcher came up with 20 schools out of 100 to participate in the study. 24 physics teachers out of 120 teachers participated in the study and 400 students out of 4,000 students participated in the study.

### **3.5. Research instruments**

The data was collected using questionnaires which were an effective and good research instrument for the survey method (Ogula 1999). The respondents always give honest answers because they remain anonymous and have adequate

time to consult and think out. The researcher used both closed and open ended questions to help draw in quantitative and qualitative data. The respondents were treated almost at the same time to help bring down biases resulting from personal characteristics. The questionnaires were developed by the researcher to collect data from 20 secondary schools. The questionnaires were in three categories:

### **Headteachers questionnaire**

It had five sections; part A dealt with demographic data which contained the background of the headteacher, general information about the school and subject selection, part B dealt with professional training of the headteacher and some of the staff, part C dealt with availability of teaching and learning resources in their school, part D dealt with the attitude of the girls towards physics and their focus on future careers. Part E dealt with the guidance and counseling in their school.

### **Physics teachers questionnaire**

It also had five sections: part A dealt with demographic data which included the gender, age bracket and the subject combination, part B dealt with professional training of the teacher, part C dealt with the availability and utilization of resources in their school, part D dealt with the attitude of girls towards physics and their future career. Part E dealt with career master and counseling in subject selection.

### **Students Questionnaire**

It was divided into five parts, part A demographic information which included the gender, age bracket, the type of the school and subject combination, part B dealt with availability of teaching and learning resources in the school, part C dealt with girls attitude towards physics as a subject, part E dealt with students aspired career and subject choice.

### **3.6 Instruments pre-testing**

External validity, which has to do with representativeness of the sample with regard to the target population was done on pilot study of two secondary schools. Two headteachers, two physics teachers and thirty students were used for the pilot study. The researcher estimated tests-re-test reliability by administering the same test to the same sample on two different occasions. This assumed that there is no substantial change in the construct being measured between the two occasion, the amount of time allowed between treatments was critical. The results obtained from pre-testing were used to calculate the reliability. (Pearson's product in moment correlation). The items were found to be 0.80 reliable therefore as the items were highly correlated, the instruments were adopted. The pre-testing enabled the researcher to determine whether items were correctly worded and identifying ambiguities in order to avoid misrepresentation when administered in the population in the main study.



### **3.7 Validity of the instruments**

Validity is the extent to which an instrument achieves the purpose for which it was designed to achieve. (Njira 2007). Gacarira (2007) noted that content validity is established by an expert. The researcher consulted the supervisors who validated and enhanced the value and the contents of the research instruments. In addition, the pilot study helped the researcher to improve the face and the content validity of the instruments. Any item that was found to be ambiguous in enlisting relevant information was modified and restructured.

### **3.8. Reliability of Instruments**

Reliability of an instrument concerns the degree to which a particular instrument can consistently yield a similar result over a number of repeated trials (Orodho, 2004). To ensure reliability of research instruments the test- retest method was used. This involved administering the same instruments twice to the same group of respondents within a period of three weeks between the first and second test. The two sets of scores were regressed using the Pearson product moment correlation coefficient formula to determine the correlation coefficient. According to Mugenda and Mugenda (2003) a correlation coefficient of 0.80 is acceptable. The researcher accepted 0.83 for the headteachers questionnaire, 0.86 for the physics teachers and 0.85 for the students for both those who enrolled and those who did not enroll in physics..

### **3.9. Data collection procedures**

The researcher secured a letter of introduction from the head of the Department of Administration and Planning from the University of Nairobi,

which stated the purpose of the study. The researcher obtained research permit from the Ministry of National Commission for Science, Technology and Innovation that enabled him to collect the raw data from the field. The researcher through the District Education Officer in Kisumu District visited the selected schools and after establishing the rapport with each head teacher, the questionnaires were distributed.

### **3.10. Data analysis procedures**

Data analysis is the process of systematically sorting and arranging data and other materials from the field with an aim of understanding and presenting them to others (Mwanyuli, 2008). Data collected was analysed using statistics and content analysis. Descriptive statistics refer to procedure for organizing, summarizing and describing quantitative information known as data, (Munguti, 2009). All answered questionnaire items and answers were organized through coding by categorization. This involves identifying items that have the same themes and putting them in topics. The quantitative data was analyzed by descriptive analysis with the help of statistical package for social science (SPSS version 18) for windows. Data were presented using frequency distribution Tables, pie charts, graphs and percentages. Qualitative data was first analyzed by content analysis by dividing data into views and sub-topics according to questionnaires items and then the results were analyzed by descriptive analysis.

## CHAPTER FOUR

### DATA ANALYSIS AND INTERPRETATION

#### 4.1 Introduction

This chapter presents the quantitative analysis and interpretation of data collected from the respondents through questionnaires to students, physics teachers and headteachers. It gives the findings from the questionnaires and other observations that were encountered during the field work. The data has been analysed in categories to give clear vivid findings of the study. The study targeted a total of 444 respondents. This comprised of 20 headteachers, 24 physics teachers and 400 students. The purpose for this study was to investigate the school factors influencing enrolment of female students in physics in public secondary schools in Kisumu district in Kenya.

#### 4.2 Questionnaire return rate

Three categories of questionnaires were used to collect data. The Headteachers, the physics teachers and the students' questionnaires. Table 4.1 shows the respondents questionnaire return rate.

**Table 4.1**

**Respondents questionnaire return rate**

<b>Respondents</b>	<b>Expected response</b>	<b>Actual response</b>	<b>Response rate percentage</b>
Headteachers	20	20	100
Physics teachers	24	24	100
Students	400	400	100
<b>Total</b>	<b>444</b>	<b>444</b>	<b>100</b>

This represented 100 percent return rate for all the respondents. The researcher personally distributed the questionnaire to the respondents and ensured that all were properly filled and then collected them.

#### **4.3 Demographic information of the respondents**

This section presents background information of the Headteachers, physics teachers and students and it highlights the major characteristics of the target population in the study. This was necessary in shading light on the school characteristics that could have influenced female students' enrolment in physics in Kisumu District. The demographic information provided a summary concerning gender of Headteachers. Physics teachers, their age, professional qualifications type of school, subject combination and the period they have served as teachers in their professional lives and Headteachers of their respective schools. It also indicates age of students selected from form three and four in public secondary schools in Kisumu district

The student's demography information comprised of their gender, age, type of schools, science subject combination. Teacher s demographic data gathered information such as their gender, age bracket, subject combination they take.

#### **4.4 Gender of respondents**

The student's gender targeted girls only. Gender of physics teacher's gender was to help the researcher to find out whether girls have female role

models who can assist in enhancing girls participation in physics. Gender of Headteachers was to provide information on the extent of the governments' commitment in ensuring gender parity in the highest position of responsibility in secondary schools. The types of gender among career master and masters were mainly to establish whether girls get opportunity to be guided by both male and female teachers about their future career. Table 4.2 presents the distribution of respondents by gender.

**Table 4.2**

**Respondents by gender**

<b>Gender</b>	<b>Headteachers</b>		<b>Physics teachers</b>		<b>Students</b>		<b>Career master</b>	
	<b>F</b>	<b>%</b>	<b>F</b>	<b>%</b>	<b>F</b>	<b>%</b>	<b>F</b>	<b>%</b>
Female	14	75	0	0	400	100	1	5
Male	6	25	24	100	0	20	19	95
<b>Total</b>	<b>20</b>	<b>100</b>	<b>24</b>	<b>100</b>	<b>400</b>	<b>100</b>	<b>20</b>	<b>100</b>

A = 20 for headteachers 24 for physic teachers and 400 for students. 20 for career masters

The headteachers who participated in the study were 14(70%). The male headteachers who participated in the study were 6(30%). The female headteachers did not only head girls' schools only but also co-educational schools. The disparity in headterachers gender is an emerging scenario all over the country. According to (MOEST 2005),girls feminine issues were well handled. The girls

also need role models in particular subjects. This indicated that girls had role models in administration. In addition, the girl child will have a role model to emulate.

The physics teachers in all the sampled schools both single sex girls and co-educational schools were male as indicated in Table 4.1. The researcher found that girls preferred more male teachers in teaching physics. The absences of female teachers had influence on girls' enrolment in physics. To some girls, it confirmed the gender stereotyping that physics is a subject which leads to mainly male careers. Thus while boys could identify with the male teachers, girls lacked a role model in terms of gender of whom they can identify with. The researcher found that boys tend to find male teachers more helpful and understanding than girls find teachers of either sex. The number of girls enrolled in physics was far below that of boys in all the co-educational schools involved in this study.

The absence of female teachers in physics reflected of the small number of females who choose to take physics as one of their teaching subjects in colleges. The researcher asserted that women tend to be under represented in science and technology globally partly due to choices they make at lower levels in their education. The researcher wanted to establish if there was a role model in the department of guiding and counseling girls in career choice and subject selection. A career counselor is normally appointed by the headteacher after close consultation to establish the capacity and willingness of the concerned teacher. There was gender differential in appointment of career masters. Only one school

had female career masters. The girls missed a role model where they were to go and express themselves especially on physics enrollment.

#### 4.5 Age of the respondents

The researcher noted that people perceptions attitudes and general outlook in life change with age. The age of students, physics teachers and headteachers was sought in order to determine whether it might have a direct or indirect influence on girls' enrollment in physics.

The researcher wanted to know the age of students since other researchers noted that girls interest in sciences declines as the years go by (Ogeto, 2008).

At form three and four many students are faced with myriad adolescent crisis ranging from conflicting body emotions, peer pressure, to pressure for professional excellence from teachers and family members. The response was as presented in the Table 4.3.

**Table 4.3**

#### Age brackets of students

<b>Students age bracket</b>	<b>Frequency</b>	<b>Percentage</b>
14 years and below	5	1.25
15 to 17 years	300	75
18 to 21 years	92	23
21 years and above	3	0.75
<b>Total</b>	<b>400</b>	<b>100</b>

Table 4.2 indicates that the majority of the students were aged between 15 to 21 years. This represented by 98% (percent). These were students at the peak of their adolescence and thus need a lot of support and understanding from teachers and parents. The girls at this age were to make their personal decisions on the career they want to take and the subjects that are required for the career intended.

The researcher wanted to find out the age bracket of the respondents in order to ascertain the maturation.

Physics teachers, and headteachers age were sought analysed and presented in Table 4.4.

**Table 4.4**

**Distribution of headteachers, physics teachers and career masters according to age.**

Age bracket	Headteachers		Physics teachers		Career masters	
	F	%	F	%	F	%
25 years and below	0	0	2	8.3	0	0
26-30 years	2	10	2	8.3	4	20
31-40 years	2	10	12	50	10	50
41-50 years	12	60	6	25	5	25
Above 50 years	4	20	2	8.3	1	5

n-20 for headteachers, 24 physics teachers and 20 career masters



The age of headteachers and physics teachers showed the likelihood of solving a problem brought to their attention by the girl students especially on physics enrolment. The researcher stipulated that mature teachers displayed awareness of the curriculum related problems that girls face in trying to make a choice in subject selection. Their attitude is in regard to girl's innate abilities and potential growth with age maturity and work experience. Girls concept of ability and aptitude in turn tended to mirror those of their teachers.

Majority of head teachers are in the range of 41-50 years (60.7%). This implied that they were quite experienced in teaching profession and thus should be able to handle administrative duties effectively. In addition, they can command respect from their relative young teaching staff. Only four head teachers were above 50 years while only two were in age bracket (26-30) years and only two in the age bracket of (31-40) years. Though most of the headteachers are quite experienced in teaching, their effectiveness in administration depended on their level of commitment and their effort in keeping abreast of emerging information about efficient institutional management. The researcher noted that the head teachers who were already above 50 years are in the decline stage of their career. This is the depreciation stage when the teachers' professional and physics abilities begin to wane as they approach their retirement. The researcher noted that, teachers and other employees with higher professional qualifications had their maintenance and decline stages pushed to far beyond 50 years.

Twelve physics teachers were in the range of 31 to 40 years, six in the range of 41-50 years while the other ranges they have two teachers each. According to the analysis of their professional qualification, all teachers were either diploma or degree holders in education. Thus, they were trained to teach physics at secondary school level and there was no doubt that they could handle their work well. In addition, all of them have been attending the SMASSE in service, training regularly. The researcher noted that majority of physics teachers were in the age of establishment and maintenance stage. At establishment stage, teachers' endeavour to get an in depth understanding of their teaching job and then strive to make an impact in their institutions. The researcher noted that it was important for headteachers to assist teachers at this age to realize their potential. For instance, a teacher were striving to make physics more popular to girls by organizing educational trips and taking part in contests and symposiums were accorded a lot of moral, material and financial support from their headteachers. At maintenance stage, teachers had entrenched themselves in the teaching profession. It was difficult for most teachers to leave the teaching profession at this stage due to both their long investment in the teaching career and lower marketability as a result of age. The researcher noted that at this stage, if teachers failed to meet new motivating challenges such as acquiring certain professional qualifications for the position, they might consider work as just routine and put no great effort to improve. Most of the career masters fell in this stage.

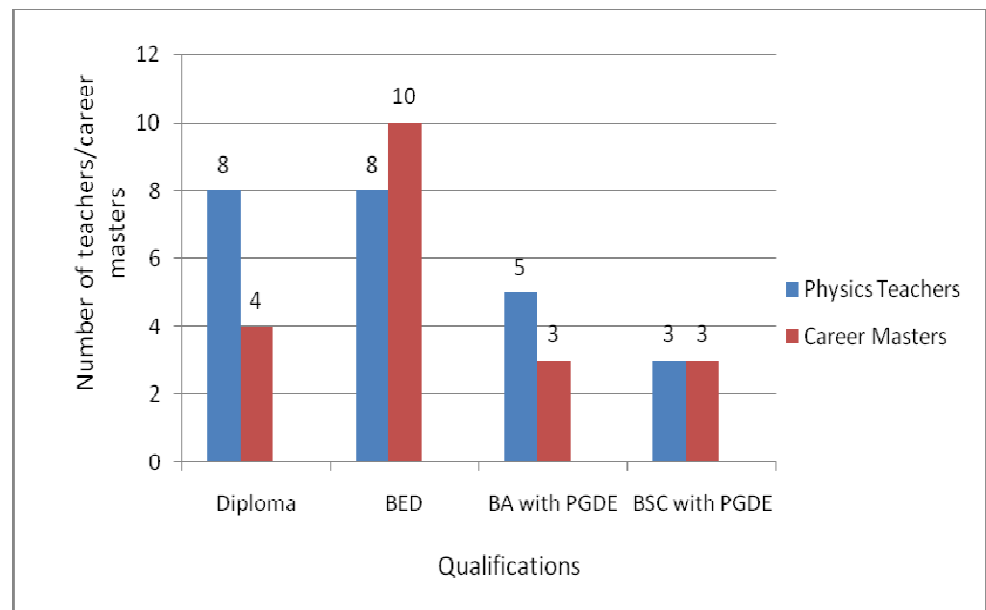
Four career masters were below 30 years, ten in age bracket 31-40 years, five in age bracket 41-50 years and one above 50 years. Thus, most of them were quite experienced in the teaching profession. However their effectiveness depended on proper training in career master and counseling and continued interest in acquiring the new upto date information on varied fields. Data analysis from headteachers questionnaires revealed that six of them were computer illiterate, twelve were slightly literate and only two represented by 10% could successfully operate a computer. The researcher noted that they had not benefitted from the unlimited information contained in the world wide web. The researcher noted that it was imperative for all to develop a reading culture or relinquish the duties to young teachers who might be dynamic and well versed with modern sources of information. The researcher noted that guidance and counseling in Africa will bear fruits if students received an attributional training treatment exhibited significant changes.

#### **4.6 Professional training of teachers**

The researcher sought to know the educational qualification of physics teachers and career masters in order to ascertain the likelihood of them being active role models to the female students.

Professional training determined the effectiveness of teachers. Both physics teachers and career masters professional training was sought by the researcher to establish whether they were qualified to carry out their

responsibilities effectively. Data concerning the physics teachers and career masters' professional training was collected, analysed and presented in Figure 4.1.



**Figure 4.1**

**Physics Teachers and Career Counselor Professional Qualification**

It is quite evident from figure 4.2 that all physics teachers were professionally trained. The number of diploma holders were 8 represented by (33.3%) and the bachelors of Education holders were also 8(33.3%) while the rest had post graduate diploma in education after their first degree in sciences. These teachers were equipped with knowledge to capture the student's interest, retain it and above all to present subject matter in a non threatening manner to the students.

All career masters were also trained as a teachers. Four were diploma holders while ten had BED degree. The remaining teachers had initially not trained as teachers but later went for PGDE. Though all career masters were professional teachers, non of them had professional training in career master and counseling in a college setting. However 60% of them had attended seminars on general counseling and guidance at district levels. They were appointed by their respective head teachers to assist the students in subjects selection after form two.

#### **4.7 Teaching subjects**

The researcher sought information on the two subjects in which both teachers and head teachers were professionally trained to teach. The information on teaching subjects was used to provide more insight on the students. Perceived notion that certain subjects always go together.

Out of the twenty four physics teacher respondents, twenty 88.3% were teaching physics and mathematics while four 16.7% were teaching physics and chemistry. In many teachers training institutions, physics is normally combined with either chemistry or mathematics, thus, the respondents' teaching subjects combination was as expected. Since the majority of teachers who teach physics also teach mathematics, students who experience difficult in mathematics might have associated physics with the same difficult. This perceived difficult was used to explain why girls enrolment in physics remain low despite their good performance in forms one and two.

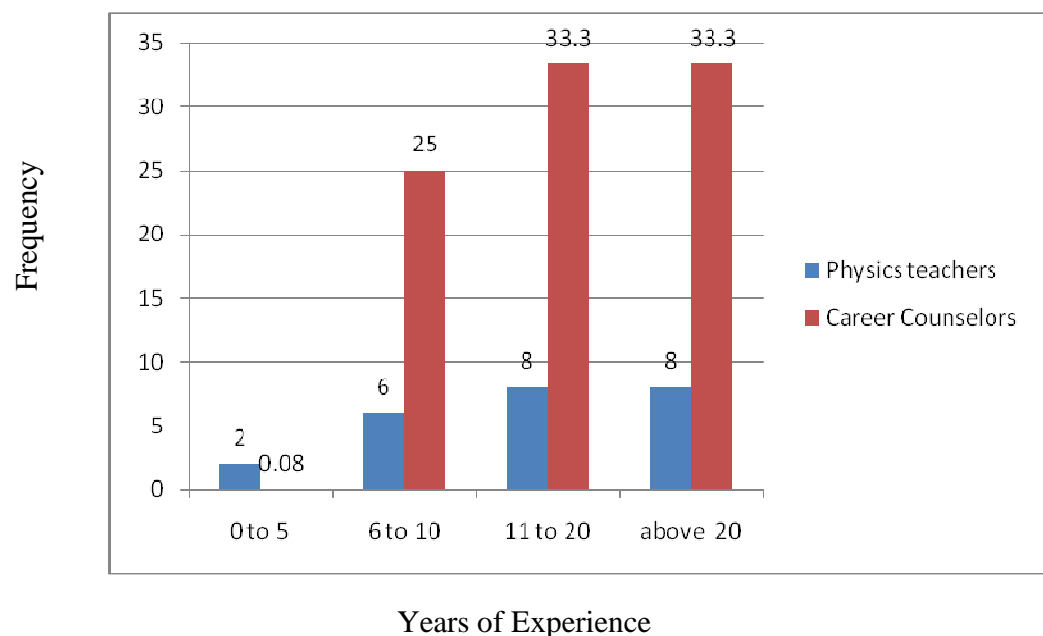
According to Lengoiboni (2007), the TSC secretary, a headteacher should ensure that he/she teachers at least one of the classes in the school in order to be in touch with students and able to effectively supervise curriculum implementation. This directive notwithstanding, the researcher found that only eight (40%) attended their assigned lessons. Twelve (60%) headteachers did not attend any lesson though some had been placed on the school teaching timetable as just a formality. The information collected, revealed that the headteachers' teaching subjects were varied. The researcher categorized the subjects into two (science subjects and Art subjects) for easy analysis. This analysis was done in testing the relationship between the headteachers teaching subjects and their competence in guiding students appropriately on science subjects selection.

Fourteen headteachers (70%) were specialized in art subjects while six (30%) were specialized in sciences. The researcher found that headteachers who teach sciences are more responsive to equipping schools laboratories with the required apparatus than their art subjects specializing counterparts. In addition, the science subjects trained headteachers were better placed in guiding and counseling students on science based career.

#### **4.8 Response on teaching experience of physics teachers and career counselors**

The researcher wanted to establish if the respondents had enough experience to handle physics problems and guide the students to reach their expectations in life. Their responses are as shown in Figure 4.2.

Teaching experience to a larger extent determined the effectiveness of teachers. The researcher noted that physics teachers and careers masters who have worked and instructed students for long are well versed with students perceived problems in physics as a subject and physics oriented careers. Figure 4.2 shows teaching experience of teachers and career masters.



**Figure 4.2**

**Teaching experiences of physical teachers and career masters.**

Figure 4.2 shows that only two teacher had taught for a period of less than five years. The teachers had been hired by the BOG to replace a recently retired teacher and the one who had passed on respectively. However, they were professionally trained. Eight teachers (33.3%) teachers had a teaching experience ranging from five to ten years, while six (25 % had an experience of eleven to

twenty years and eight teachers (33.3% had an experience of above 20 years. This shows that most of the teachers were highly experienced in teaching physics and therefore were expected to be thorough in delivering the subject matter. In addition, all the physics teachers in the sampled schools have been attending SMASSE in-service training regularly, thus, enriching the pedagogical skills. Just like physics teachers, majority of career masters had been teachers for long. Two masters have been teaching for five to ten years while eighteen (90%) were termed as veteran teachers since they had a teaching experience ranging from eleven years. However, on their response on the question how they were informed of the job markets demand, it showed out of that 50% of the career masters knew nothing about the current job market demand while the rest disclosed that they knew very little. The researcher established that long experience in teaching does not always translate to effective career master and counseling.

#### **4.9 Response from headteachers, physics teachers and students on what determined science subject combination**

The researcher wanted to establish from the respondents what guided their subject combination in science in order of priority. The responses were shown on Table 4.5.



**Table 4.5**

**Response on science subject combinations**

<b>Determinant in subject combination in order of priority</b>	<b>Head teachers</b>		<b>Physics teachers</b>		<b>Students</b>	
	<b>F</b>	<b>%</b>	<b>F</b>	<b>%</b>	<b>F</b>	<b>%</b>
Future career	4	20	6	25	220	55
Overall grade in K.C.S.E.	16	80	18	75	180-	45
<b>Total</b>	<b>20</b>	<b>100</b>	<b>24</b>	<b>100</b>	<b>400</b>	<b>100</b>

Most headteachers 16(80%) gave first priority to overall grade in KCSE to determine science subject combination. There was no problem provided the overall grade in K.C.S.E. was good. Only 4(16%) headteachers were in favour of future career. This mean that they were informed on the job market demand and the subject combination. The vision 2030 was also in their mind.

The highest number of physics teachers gave the first opportunity to overall grade in K.C.S.E. They gave the first priority to the mean score of their subject. They were to use all means to eliminate non performance in the subject. That is why some subjects like mathematics in most schools were to be a determinant to take physics. Subjects like history, C.R.E. which were a darling to most girls were used to block them from taking physics.

Those students who gave first priority to future career were 20 which was 55 percent and those who took KCSE overall grade were 180 which was 45%.

The gap between those who gave future career and overall grade in K.C.S.E. is 10%. This was due stereotyping on male and female subjects. The students focused on courses like teaching, nursing, secretarial among others where physics is not a requirement.

#### **4.10 Response on availability of teaching and learning resources**

The researcher wanted to establish from the headteachers whether the teaching and learning resources were adequate or inadequate. He also wanted to know if there were a laboratory for each science subject. Lastly he wanted to know whether the available teaching and learning physics resources had any influence on female students' enrolment in physics.

The researcher wanted to establish from the physics teachers whether the teaching and learning resources were adequate or inadequate and what the outcomes of either answer were. He also wanted to know if they had laboratories for each science subject. The researcher wanted to establish the type of audio visual resources used in teaching physics. Lastly he wanted to establish whether the available teaching and learning resources has got any influence on female enrolment in physics.

The researcher wanted to establish from the students if they had a library in their school. The researcher wanted to know how the student rates the stock of physics books in the school library whether they are adequate or inadequate. The researcher wanted to know whether the practical lessons are conducted and the

method which is mostly used in teaching physics by their teachers. Lastly the researcher wanted to establish from the learners whether the availability of teaching and learning resources in their schools had any influence in enrolment of female in physics.

#### 4.11 Availability of physical facilities

The researcher wanted to establish the availability of physical facilities in the schools. The responses were as in table 4.6.

**Table 4.6**

#### **Response on availability of physical facilities**

	<b>Type of School</b>	<b>No. of Streams</b>	<b>Number of Labs</b>	<b>No. of Extra rooms</b>
1.	Mixed	2	1	None
2.	Mixed	3	2	None
3.	Mixed	2	2	None
4.	Girls only	4	3	5
5.	Mixed	2	None	2
6.	Girls only	4	3	2
7.	Girls only	3	3	3
8.	Mixed	1	None	1
9.	Mixed	1	1	1
10.	Mixed	1	1	None
11.	Mixed	1	1	1
12.	Girls only	3	2	3
13.	Mixed	1	1	None
14.	Mixed	1	1	None
15.	Girls only	2	3	3
16.	Mixed	1	1	None
17.	Girls only	1	3	3
18.	Mixed	2	2	1
19.	Girls only	2	3	4
20.	Girls only	1	3	4

N – 20

According to the responses from Table 4.6 the researcher found out that schools had inadequate teaching and learning facilities of physics. The researcher noted that girls' only schools were well equipped and could accommodate girls who were interested in enrolling in all science subjects.

#### **4.12 Physics teachers responses on the facilities**

In teaching and learning resources all the physics teachers (24%) agreed that they were inadequate. However all the twenty schools were supplied with electricity, had the basic apparatus necessary for physics experiments, provision of reliable water supply. The researcher noted that no school had the modern physics instruments such as the Geiger matter tube for radio radiation detection and the Cathode Ray oscilloscope (CRO) meant for the study of waves. Though these instruments make physics more practical rather than dealing with abstract concepts, secondary physics can be handled by both students and teachers without using them.

Most of the schools laboratories were not built according to the modern standards for safety reasons especially incase of fire. The researcher established that only 4 schools used the audio visual resources. Most of the teachers used abstract concepts.

According to the respondents the researcher established that the enrolment in physics was not determined by the availability of resources. This was a

contradicting with the headteachers; response which said that enrolment of female students was due to inadequate teaching and learning facilities.

#### **4.13 Students responses of teaching and learning facilities.**

The response of the students on the availability of laboratories in their school were; seven schools (35%) had one laboratory, four schools (20%) had 3 laboratories two schools (10%) had no laboratory and seven schools (35%) had three laboratories. Most schools had libraries but not well stocked with modern books. The students were told to buy most of the books before they report to classes in the beginning of the year.

#### **4.14 Areas where experiments were conducted**

Physics practical lessons were conducted in different places as shown on Table 4.7.

**Table 4.7**

#### **Responses on areas where experiments were conducted**

<b>Conduction of physics practical lessons</b>	<b>Chemistry lab.</b>	<b>Biology lab</b>	<b>Physics lab</b>	<b>Classroom</b>
<b>Total</b>	<b>180</b>	<b>100</b>	<b>50</b>	<b>70</b>

From the above response the researcher observed that most schools gave priority to chemistry lab in their schools followed by biology and lastly physics.

It was established that chemistry is compulsory to students in all schools of the study.

#### 4.15 Common teaching methods used by teachers in Physics

Teaching of physics lessons varied from one teacher to another in order of priority. The responses on the teaching methods used by the physics teachers in order of priority are as shown in Table 4.8.

**Table 4.8**

**Responses on the teaching methods in order of priority**

<b>Teaching method strategy</b>	<b>Frequency</b>	<b>Percentage</b>
Lecturer only	80	20
Lecture and demonstration	140	35
Lecture demonstration, question and answer	150	40
Lecture, demonstration, question and answer and discussion	20	5
<b>Total</b>	<b>400</b>	<b>100</b>

The researcher wanted to establish on how Physics was being taught and whether the methods used had any influence in physics enrolment. The responses from the students are shown in table 4.8. The lecture method and the demonstration was used by 140(35%) and 150(40%) used lecture, demonstration and question and answer. Lecture, demonstration, question and answer and

discussion method was used by 20(5%). The researcher noted that teachers are doing recommendable work by combining several pedagogical methods.

The researcher established that the inadequate facilities did not influence the enrolment of female students in physics but there were some other reasons like blocking physics with other subjects like history, C.R.E, Geography which are a darling to most female students. In some schools you were to be good in mathematics in order to enroll in physics. Some were to be enrolled depending on the marks they scored in form one and two in the subject. Some students also said that the physics teachers were very harsh to them.

#### **4.16 Responses on attitude towards physics**

The researcher wanted to establish from the headteachers what they can do to influence female enrolment in physics. He also wanted to establish if the millennium development goal of education and employment opportunities in both Arts and Science Field can be achieved by 2015 and vision 2030. The researcher wanted to establish from physics teachers if physics oriented careers are equally suitable for both boys and girls. If there is need for concern due to the small number of girls opting to do physics, a student needs not to be excellent in mathematics to do physics. In ensuring gender equity and equity in higher education and employment, more girls should enroll in physics, any interested student in physics should enroll regardless of marks scored in form 1 and 2, under presentation of women and girls in science and technology negates the place of technology development in Kenya. The researcher also wanted to establish ways

to encourage more girls do physics. The method of teaching in order of priority was also to be established. The researcher wanted to establish from the students if physics is one of the most useful subject. It was noted that everybody should have basic physics knowledge. The researcher established that girls' understand physics as well as boys. There are many physics oriented careers where girls can fit, you do not need to be excellent in mathematics to do physics. There headteachers were actively involved in teachers/students meeting in subject selection.

#### **4.17 Headteachers response on students' attitude towards physics.**

The headteachers responses made the researcher to establish factors that led to physics enrolment in secondary schools as follows:

Teachers behaviour and attitude had key influence on a student attitude, motivation and continuing participation in the subject. The relationship between physics teachers and students will contribute to girls' enrolment. The subject was blocked by other subjects. Learners were not guided on career choices and job market. Selection of the subjects was not free and fair. Most teachers of physics and mathematics and physics combination The researcher established that the millennium goal and vision 2030 cannot be achieved if the gender parity and equality cannot be established.



#### 4.18 Responses of physics teachers towards students' attitude towards physics

The response of the physics teachers was as shown in Table 4.9.

**Table 4.9**

##### **Physics oriented career are equally suitable for both boys and girls**

<b>Response to questions</b>	<b>Frequency</b>	<b>Percentage</b>
Strongly agree	0	0.0
Agree	10	41.7
Undecided	8	33.3
Disagree	4	16.7
Strongly disagree	2	8.3
<b>Total</b>	<b>24</b>	<b>100.0</b>

Majority of teachers represented by 75.0% agreed that physics oriented careers are equally suitable for both men and women. Such a positive attitude creates an impetus for fair consideration that both girls and boys needed assistance. It also implied that most of physics teachers are not influenced by a patriarchal inhibitions and instead recognize women and girls capacities to be strong, capable and intelligent thus conforming to one of the basic factors of the Social theory.

#### 4.19 Number of girls opting to take physics

The researcher wanted to establish the number of girls opting for physics.

The response is as shown in Table 4.10.

**Table 4.10**

**Response on number of girls opting to take physics**

<b>Response to questions</b>	<b>Frequency</b>	<b>Percentage</b>
Strongly agree	0	0.0
Agree	21	87.5
Undecided	2	8.3
Disagree	1	4.2
Strongly disagree	0	0
<b>Total</b>	<b>24</b>	<b>100</b>

Two teachers were undecided (8.3%) while one disagreed (4.2%). Twenty one (87.5%) teachers agreed that there is concern due to the number of girls opting to do physics. Many teachers could remember with nostalgia when their classes used to be full before physics became optional. Some physics laboratories which were well equipped to cater for the large number of students were converted to other uses.

The researcher noted that the connection between mathematics and physics has almost been a controversy among teachers and students. Some teachers believed that an average student in mathematics should not enroll in

physics beyond form two, while others don't agree with them. In some schools mathematics grade were used as a filter to get those to proceed with physics.

#### **4.20 Excellency in mathematics is not a criteria of taking physics**

The researcher wanted to establish from the students whether mathematics was used as a criteria for enrolling in physics. The response was as shown in Table 4.11.

**Table 4.11**

#### **Response on Excellency in mathematics is not a criteria of taking physics**

<b>Response to questions</b>	<b>Frequency</b>	<b>Percentage</b>
Strongly agree	2	8.3
Agree	12	50
Undecided	10	41.7
Disagree	0	0
Strongly disagree	0	0
<b>Total</b>	<b>24</b>	<b>100</b>

Teachers response to the statement that a student need to be excellent in mathematics to do physics drew varied reactions. Only two teacher strongly agreed, twelve teachers agreed while ten chose to remain non-committal.

Physics is done at secondary school level requires understanding of basic concepts and correct substitution in the appropriate formulas. A student who is

just average in mathematics can do well in physics. The researcher noted that teachers who insisted that bright students in mathematics to take physics deterred many students and in particular those girls who were interested to enroll in physics.

#### **4.21 Gender quality and equity in education and employment in relation to physics enrolment**

The researcher wanted to establish the under-presentation of women and girls in science and technology. The responses were as shown in Table 4.12.

**Table 4.12**

**Response on ensuring gender quality and equity in high education and employment more girls should enroll in physics.**

<b>Response to questions</b>	<b>Frequency</b>	<b>Percentage</b>
Strongly agree	0	0
Agree	18	75
Undecided	0	25
Disagree	6	0
Strongly disagree	0	0
<b>Total</b>	<b>24</b>	<b>100</b>

In the statement that underrepresentation of women and girls in science and technology negates the pace of technology development in Kenya. Six teachers agreed sixteen teachers were undecided and two teachers disagreed. This

is a clear indication that the teachers did not agree with the statement. Therefore the government should employ more physics female teachers. Although Munguti (2004) found out that girls were positive towards their teachers regardless of gender, presence of more female teachers may lead to increase in girls enrolment in physics.

#### 4.22 Interested students in physics to enroll regardless of their marks

The researcher wanted to establish the criteria which were used to enroll female students in physics, the responses were as shown in Table 4.13.

**Table 4.13**

**Interested students in physics to enroll regardless of their marks.**

<b>Response to questions</b>	<b>Frequency</b>	<b>Percentage</b>
Strongly agree	0	0
Agree	14	58.3
Undecided	4	16.7
Disagree	4	16.7
Strongly disagree	2	8.3
<b>Total</b>	<b>24</b>	<b>100.0</b>

Fourteen teachers (58.3%) agreed that if the students had interest in taking physics they should enroll. Four teachers (16.7%) were undecided. Four other teachers disagreed (16.7%) while two teachers strong disagreed. The researcher

noted that the majority of the teachers agreed to enroll students who had interest in physics.

#### **4.23 Under-presentation of women and girls in science and technology negates the base of technology development in Kenya**

The researcher wanted to establish if the under-presentation of women and girls in science and technology negates the pace of technology development in Kenya. The responses were as table 4.14.

**Table 4.14**

#### **Response on under-presentation of women and girls in science and technology negates the base of technology development in Kenya**

<b>Response to questions</b>	<b>Frequency</b>	<b>Percentage</b>
Strongly agree		
Agree	6	25
Undecided	16	66.7
Disagree	2	8.3
Strongly disagree		
<b>Total</b>	<b>24</b>	<b>100.0</b>

Six teachers (25%) agreed that under-presentation of women and girls in science and technology negates the pace of technology development. Sixteen teachers were non-committal (66.7%) while two teachers (8.3%) disagreed. The

researcher noted that under-presentation of women and girls in science and technology negates the base of technology development in Kenya (91.7%).

**4.24 Girls need more support patience and encouragement than boys who excel in physics.**

The researcher wanted to establish whether girls need more support, patience and encouragement than boys who excel in physics. The responses are as indicated in Table 15.

**Table 4.15**

**Response on girls need more support patience and encouragement than boys who excel in physics.**

<b>Response to questions</b>	<b>Frequency</b>	<b>Percentage</b>
Strongly agree	4	16.7
Agree	12	50
Undecided	0	
Disagree	8	33.3
Strongly disagree	0	
<b>Total</b>	<b>24</b>	<b>100</b>

From the table above the researcher noted that girls needed more support patience and encouragement than boys. This is because those who agreed were sixteen which led to (66.7%) while those who did not agreed were eight which led to (33.3%).

#### **4.25 School physical facilities and Teaching resources**

The researcher found out that girls from only schools were well equipped and could accommodate girls who were interested in enrolling in all science subjects. However, the number of girls doing the three sciences was still low due to varied reasons. As it had been mentioned earlier, though a student can enroll in all science subjects, there might be other conditions put by professional masters such as blocking physics with history and thus putting off many girls. On the other hand most of the mixed schools had only one laboratory in spite of having many students per class. In addition, most of them did not have extra classrooms, when the researcher observed the responses of head teachers the reasons for not offering the three sciences in their schools the majority of them gave inadequate facilities as the main reason.

However all the twenty schools were supplied with electricity, had the basic apparatus necessary for physics experiments and above all, had provision of reliable water supply. This implied that girls enrolment in physics could not be attributed to lack of physical facilities and teaching or learning resources. The very laboratories that catered for many girls in chemistry and biology could also cater for girls in physics. The researcher noted that no school had the modern physics instruments such as the Geiger Malter tube for radio active radiation detection and the cathode Ray oscilloscope (CRO) meant for the study of waves. Though these instruments make physics more practical rather than dealing with abstract concepts, secondary physics can be handled by both students and teachers



without using them. Angora (2003) found that most headteachers were less keen in encouraging girls to do physics due to low grades which affected the overall school mean grade negatively. The headteachers attitudes has however been changing gradually due to better physics grades posted by students in many schools. If the school administrators will become more concerned and committed even in Kisumu district on the issue of girls choice of physics, the number of participants can increase.

#### **4.26 Students, teachers, head teachers responses on student's choice of subjects being free and fair**

The researcher wanted to establish from the students if the subject choice was free and fair. The responses are shown in table 4.16.

**Table 4.16**

#### **Responses of students, teachers, head teachers responses on student's choice of subjects being free and fair**

Response to questions	Number of students		Number of teachers		Number of the headteachers	
	F	%	F	%	F	%
Strongly agree	90	22.5	8	33.3	10	50
Agree	108	27	10	41.7	8	40
Undecided	22	5.5	4	16.7	2	10
Disagree	72	18	-	-	-	-
Strongly disagree	108	27	2	8.3	-	-
<b>Total</b>	<b>400</b>	<b>100</b>	<b>24</b>	<b>100</b>	<b>20</b>	<b>100</b>

It is quite evident from the Table 4.8 that the majority of head teachers considered the manner in which the students' subject selection exercise was done as completely free and fair. Fifty percent of them strongly agreed while 40% agreed to the statement only two head teachers were non-committal. Conversely, students and teachers response did not rate the subjects' selection so highly. Only eight teachers found the selection exercise as free and fair. Ten teachers were undecided, four disagreed while two teachers strongly disagreed. These sixteenth teachers did not term the exercise as free and fair and therefore casting a aspersions into headteachers honesty. It is possible that the ten teachers who remained undecided had conflict in making decision since they felt as an act of betrayal to their seniors if they disagreed that the selection exercise was free and fair.

#### **4.27 Response from physics teachers attitude towards girls future in physics oriented career.**

The researcher wanted to establish whether physics oriented careers are equally suitable for both boys and girls. He also needs to establish whether there is a concern on the number opting to take physics. Researcher was to establish if the student had to be excellent in mathematics to take physics. It was also to establish if any interested student in physics should be enrolled regardless of the marks scored in form 1 and 2. Under-presentation of women and girls in science and technology negates the pace of technology development in Kenya. The researcher also sought out to know on what should be done to encourage more

girls do physics, outline the methods used in teaching in order of priority and lastly if the millennium goal can be reached by 2015.

#### **4.28 Physics oriented career are suitable for both boys and girls.**

The researcher wanted to establish if the physics careers can be taken by both boys and girls as shown in Table 4.17.

**Table 4.17**

#### **Responses on Physics oriented career are suitable for both boys and girls**

<b>Response to questions</b>	<b>Number of students</b>	<b>%</b>
Strongly agree	16	66.7
Agree	8	33.3
Undecided	0	
Disagree	0	
Strongly disagree	0	
<b>Total</b>	<b>24</b>	<b>100</b>

All physics teachers agreed that there was a concern on female students' enrollment in physics. 16 teachers represented by (66.7%) strongly agreed and 8 teachers represented by 33.3% agreed. The researcher established that the physics careers were good for both boys and girls.

#### 4.29 Excellence in mathematics as a criterion to do physics.

The researcher wanted to establish the criteria of doing physics. Responses whether the students needed to be excellent in mathematics to do physics were shown in table 4.18.

**Table 4.18**

**The response on excellence in math as a criteria for taking physics.**

<b>Response to questions</b>	<b>Frequency</b>	<b>Percentage</b>
Strongly Agree	10	41.7
Agree	2	8.3
Undecided	0	0
Disagree	10	41.7
Strongly disagree	2	8.3
<b>Total</b>	<b>24</b>	<b>100</b>

The researcher noted mixed reactions on those who disagreed having 50% and those agreed having 50%. Most of those teachers who disagreed came from the mixed schools where boys were doing well than girls in physics. Those who agreed were mixed up of co-educational schools and girls' only schools.

#### **4.30 Gender equality and partly in enrolment needed more girls to enroll in physics**

The researcher wanted to establish on gender equality and parity in employment The results are shown in Table 4.19.

**Table 4.19**

#### **Gender equality and partly in enrolment needed more girls to enroll in physics**

<b>Response to questions</b>	<b>Frequency</b>	<b>Percentage</b>
Strongly Agree	8	33.3
Agree	10	41.7
Undecided	6	25.0
Disagree	0	0
Strongly disagree	0	0
<b>Total</b>	<b>24</b>	<b>100</b>

The researcher noted that the physics teachers wanted the female students to be enrolled in physics. Those who strongly agreed were 8 which is (33.3%) and those agreed were 10 which is (41.7%) and those who were undecided were 6 which is (25%).

#### **4.31 Enrolment in physics**

The researcher wanted to establish if the teachers considered marks in the enrolment of students in physics. The results are shown in Table 4.20.

**Table 4.20**

**Enrolment in physics**

<b>Response to questions</b>	<b>Frequency</b>	<b>Percentage</b>
Strongly Agree	0	0
Agree	6	25.0
Undecided	0	0
Disagree	8	33.3
Strongly disagree	10	41.7
<b>Total</b>	<b>24</b>	<b>100</b>

The researcher noted that only six agreed that a student can enroll in physics irrespective of the marks attained in form one and two. These were from the only girls schools. 8 teachers disagreed on allowing the students to enroll in physics irrespective of the marks attained 10 teachers strongly disagreed that the students can be enrolled in physics irrespective of the teacher's performance.

**4.32 Under-presentation of female negates pace of technology development**

The researcher wanted to establish the effects of under-presentation of women and its consequences in technology development in Kenya. The results are shown in Table 4.21.

**Table 4.21**

**Under-presentation of female negates pace of technology development in Kenya.**

<b>Response to questions</b>	<b>Frequency</b>	<b>Percentage</b>
Strongly agree	15	62.5
Agree	8	33.3
Undecided	1	4.2
Disagree	0	0
Strongly disagree	0	0
<b>Total</b>	<b>24</b>	<b>100</b>

The researcher observed that those who strongly agreed 15(62.5%) and those agreed 8 (33.3%) led to 95.8%. this was a high percentage of agreeing that under representation of women in Kenya in science and technology negates the pace of technology development in Kenya.

**4.33 Methods used in teaching in order of priority**

The researcher wanted to establish the methods which were commonly used by most teachers and their outcomes in relation to female enrolment in physics. The results are shown in Table 4.22.

**Table 4.22**

**Methods used in teaching in order of priority**

<b>Method</b>	<b>Frequency</b>	<b>Percentage</b>
Lecture	6	25
Demonstration	3	12.5
Question and answer	2	8.3
Discussion	13	54.2
<b>Total</b>	<b>24</b>	<b>100</b>

**4.34 Guidance and counseling of students on career choice.**

The researcher wanted to establish from the headteachers if the students were guided on career choice before the subject selection exercise. The researcher also wanted to establish if the career department was effective in their schools. The researcher also wanted to establish if the headteachers are aware of current job market demand and if they are kept abreast with the latest and relevant career information. The researcher also wanted to get how they are informed on the current knowledge on various areas of career choices. Lastly the researcher wanted to know why girls prefer chemistry/biology and not physics combinations.



#### 4.35 Career guidance before subject selection

The researcher wanted to establish if the students were guided on career choice before they were to choose their subjects. The responses are as shown in Table 4.23.

**Table 4.23**

#### **Career guidance before subject selection**

<b>Response to questions</b>	<b>Frequency</b>	<b>Percentage</b>
Yes	16	80
No	4	20
<b>Total</b>	<b>20</b>	<b>100</b>

From the above response it was clear that the students were guided on career choice before the subject selection was represented by 15% headteachers (80%). For headteachers who represented (20%) did not agree on guiding the students before the subject selection. This indicates that guidance and counseling on career choice was ineffective in their schools.

#### 4.36 Latest and relevant career information

Five teachers represented by 25% said they are informed on latest and relevant information through newspapers and internet. While 15 headteachers represented by 7.5% depended fully on the career masters. These headteachers were not computer literate. The responses are as shown in table 4.24.

**Table 4.24**

**Latest and relevant career information**

<b>Response to questions</b>	<b>Frequency</b>	<b>Percentage</b>
Internet and newspapers	5	25
Career master	15	75
Subject teacher	0	0
<b>Total</b>	<b>20</b>	<b>75</b>

From the above response, the researcher noted that most of the headteachers were not fully informed on the careers associated with different science subject combinations. Most of these teachers trained in Arts subjects were found in this category. Those teachers represented by 25% trained in sciences in their professions.

**4.39 Careers and their subject combination**

The researcher wanted to establish if the teachers were aware of the courses offered in high institutions of learning and their subject combination. The response is as shown in Table 4.25.

**Table 4.25**

**Careers and their subject combination**

<b>Response to questions</b>	<b>Frequency</b>	<b>Percentage</b>
To great extent	8	40
To some extent	12	60
Not at all	0	0
<b>Total</b>	<b>20</b>	<b>75</b>

The researcher noted that the Headteachers were informed of the courses that were taken in the high institutions of learning and their subject combination.

**4.39 Awareness on job markets, remuneration, conditions and employment**

The researcher wanted to establish if the teachers were aware on current job market, remunerations and working conditions and terms of employment in various careers. The responses are as shown in Table 4.26.

**Table 4.26**

**Awareness on job markets, remuneration, conditions and employment**

<b>Response to questions</b>	<b>Frequency</b>	<b>Percentage</b>
To a great extent	2	10
To some extent	10	50
Not at all	8	40
<b>Total</b>	<b>20</b>	<b>100</b>

The researcher noted that most headteachers were not fully informed on various careers and their terms and conditions on employment.

#### **4.40 Why girls prefer chemistry and biology and not physics combinations.**

The headteachers attributed to inadequate facilities of teaching physics in their schools. They also noted that it depended on students intended career choice. Some said the girls had a negative attitude towards physics. Stereotype also contributed a lot because people have clustered subjects for men and those for women.

#### **4.41 Measure to be put in place to encourage more girls to enroll in physics.**

The researcher noted that the responses were almost the same from all head teachers. All headteachers addressed the improvement of physical facilities in their schools to accommodate all science subjects. They suggested that girls were to be fully guided and counseled on various course. Workshops and seminars should be organized to address the low enrolment of female in physics and the way in which to improve it. Stereotype curses to be addressed and women who have qualified in physics to be invited and address the girls.

#### **4.42 Status of career guidance in schools**

The researcher sought to establish whether the students were properly counseled and guided on career prospects before selecting subjects, whether career guidance in their school were effective, whether they guided the students on career prospects in their subjects, the appropriate time for subject selection,

whether students were allowed to consult their parents for subject choice, whether they were informed on current job market demand, whether they were aware of the courses offered in high institutions of learning. The responses are as shown in table 4.27.

**Table 4.27**

**Status career guidance in schools**

Statement	Response to questions			
	Yes	%	No	%
Students in my school are properly counseled on career prospects before subject selection	10	41.7	14	58.3
Career in my school is very effective	8	33.3	16	66.7
I do enlighten my students on career oriented on my teaching subjects	24	100	0	0
The process of subject selection was free and fair	10	41.7	14	58.3
Parents are consulted before subject selection	4	16.7	20	83.3

The researcher noted that 10 teachers (41.7%) agreed that guidance and counseling is done on career prospects before subject selection. 14 teachers disagreed that career prospects are not counseled properly before subject

selection. Those who disagreed were mainly from day schools and co-educational schools and vice versa.

Only 8 teachers (33.3%) agreed that career guidance and counseling were effective in their schools. This were mainly from girls only schools. 16 teachers (66.7%) disagreed that guidance and counseling on career prospects were effective in their schools. This were mainly from co-educational schools. All teachers agreed that they do enlighten their students on career prospects in their subjects. The researcher noted that any student attended physics, chemistry and mathematics classes, were informed of career prospects of these subjects. Fourteen teachers (58.3%) agreed that subject selection in their schools were not free and fair. While 10 teachers 41.7 agreed that selection of subjects was free and fair. The researcher noted that there were factors put in place in subject selection. Only four teachers agreed parents were consulted in subject selection, 20 teachers which is (83.3%) agreed that parents were not even aware on the subject combinations which their daughters had taken.

#### **4.43 Awareness on job market and relevant information**

The researcher wanted to establish the awareness of physics teachers in the world demand. The responses are as shown in table 4.28.

**Table 4.28**

**Awareness on job market and relevant information**

<b>Response to questions</b>	<b>Frequency</b>	<b>Percentage</b>
Internet and newspapers	8	33.3
Career masters	12	50.0
Headteachers	4	16.7
<b>Total</b>	<b>24</b>	<b>100</b>

The researcher noted that only 8 physics teacher (33.3%) were well conversant with the job market and were kept abreast with the latest and relevant information. They were mostly young in age as compared to their colleagues. They used internet to access the information. 12 teachers (50%) depended on career masters on the information. The same information they received was to be imparted to the children. Only 4 teachers 16.7% depended on Headteachers, some of whom also depended on career masters in their schools.

**4.44 Current knowledge on courses offered in high institutions of learning**

The researcher wanted to establish if teachers were aware on the most current knowledge on courses offered in higher institutions of learning. The responses are as indicated in table 4.29.

**Table 4.29****Current knowledge on courses offered in high institutions of learning.**

Statement	Response to questions					
	To great extent		To sure extent		Not at all	
	F	%	F	%	F	%
Career associated with different science subject combination	10	41.7	12	50	2	8.33
Courses offered in high institution of learning and their subject combination	10	41.7	14	58.3	0	0
The current job market demand and remuneration expected in various careers	4	16.7	15	62.5	5	20.83
The working condition and terms of employment	4	16.7	18	75	2	8.33

From the above response the researcher noted that most physics teachers were not informed on the current knowledge on the careers associated with different science subject combination. Only 10 teachers (41.7%) were informed to a great extent, 12 teachers (50%) were informed to some extent and two were not informed at all (8.33%). In the courses offered in high institution and their subject combination indicated that teachers were at least informed. Ten teachers who were represented by 41.7% and fourteen teachers represented by (58.3%) were informed to some extent. The information on job market demands and remuneration expected in various courses the researcher noted that only four



teachers were informed to a great extent (16.7%) and teachers who were informed to some extent were represented (62.5%) while five teachers were not informed at all (20.83%). The researcher noted that the working conditions and terms of employment in different careers only four teachers (16.7%) were informed to a great extent while 18 teachers (75%) were informed to some extent and two (8.33%) were not informed at all.

#### 4.45 Students career guidance and subject selection

The Researcher wanted to establish if the students were aware of other career masters, whether they had career guidance and counseling programmes in their school, whether they had consulted career masters on career issues, the circumstances that led to subject combination and what took the first priority in subject combination. The responses are shown in Table 4.30.

**Table 4.30**

#### **Students career guidance and subject selection**

<b>Questions</b>	<b>Response to questions</b>					
	<b>Yes F</b>	<b>%</b>	<b>No F</b>	<b>%</b>	<b>Yes F</b>	<b>%</b>
Do you know your career master in your school?	100	25	300	75	400	100
Do you have career guidance and counseling programmes in your school?	280	70	120	30	400	100
Have you consulted the school career master on career issues?	50	12.5	350	87.5	400	100

The researcher noted that 300 (97.5%) of students did not know their career masters. A smaller number (25%) agreed that they had career guidance programmes in their schools. The researcher established that career programmes were in most schools (70%). The programmes were organized in some special occasions. A large number of students (87.5%) had not consulted the career masters on career issues.

#### 4.46 Circumstances that led to subject combination

The researcher wanted to establish if the students' were informed before the selection of the subjects. The responses are as shown in table 4.31.

**Table 4.31**

**Response on circumstances that led to subject combination**

Question	Response to questions			
	Yes	%	No	%
Did you take your subject combination when you were not informed?	40	10	360	90
Were you slightly informed when you took your subject combination?	160	40	240	60
Were you quite informed when you took your subject combination?	120	30	280	70
Were you very well informed when you took your subject combination?	80	20	320	80

The researcher noted that 40 students (10%) did subject combination when they were informed on career choice. A large number 360 students (90%) choose their subject combination when they were not informed. The researcher

established that 160 students (40%) were slightly informed when they were taking subject combination, a large number of students 240 (60%) were not informed. From the responses the researcher noted that guidance on career choice before subject section was necessary.

#### **4.47 The first priority in subject combination**

The researcher wanted to establish what took the first priority in subject selection among K.C.S.E overall grade and future career prospects. The responses are as shown in table 4.32.

**Table 4.32**

#### **Responses on first priority in subject combination**

<b>Response to questions</b>	<b>Frequency</b>	<b>Percentage</b>
My overall K.C.S.E. grade	150	37.5
Future career prospects	250	62.5
<b>Total</b>	<b>400</b>	<b>100</b>

The researcher established that 250 students (62.5%) took their subject selection with career prospects in mind. The career choice were either physics oriented or not physics oriented. The one who chose overall K.C.S.E. grade were 150 students (37.5%). The researcher noted that this group of students just needed a grade. They did not mind on career choice.

#### 4.48 Circumstances that led to subject combination

The researcher wanted to establish those who motivated the students in their subject selection. The responses are shown in table 4.33.

**Table 4.33**

#### **Response on circumstances that led to subject combination**

<b>Response to questions</b>	<b>Frequency</b>	<b>Percentage</b>
Personal decision	100	25
Friends decision	50	12.5
Teachers/career master decision	248	62
Parents recommendation	2	0.5
<b>Total</b>	<b>400</b>	<b>100</b>

The researcher noted that 100 students (25%) made their personal decision on subject combination. Those who were influenced by friends were 50 students. It was noted that a great number of students 248(62%) were influenced either by the subject teacher or career masters. Very few students were influenced by their parents on subject combination (5%).

## **CHAPTER FIVE**

### **SUMMARY OF FINDINGS CONCLUSIONS AND RECOMMENDATIONS**

#### **5.1 Introduction**

In this chapter, the researcher presents a logical summary of findings, conclusions, recommendations, and suggestions for further study.

#### **5.2 Summary of the Study**

The purpose of this study was to investigate the school factors influencing enrolment of female students in physics in public secondary schools in Kisumu District, Kenya. This study aimed at addressing the following specific objectives;

To determine extent to which teachers professional training influences girls' enrolment in physics in Kisumu district, to examine the extent to which teaching and learning resources in physics influences girls enrolment in physics in Kisumu district, to examine ways in which the attitude of students towards physics influences girls' enrolment in physics in Kisumu district and to examine ways in which guidance and counseling of students on career choice has influenced girls' enrolment in physics in Kisumu district.

The study employed the descriptive survey method design method. Using questionnaires, data was collected from target population of 20 public secondary schools in Kisumu district, 24 public secondary physics teachers from Kisumu district and 400 hundred students. The stratified random sampling technique was used. Population was divided into strata of form three, form four. The number in

each strata were proportional to the size in each class. The physics teachers and Headteachers were not sampled.

Professional training of teachers had no influence on female enrolment in Kisumu district. Over 80% of the physics teachers respondents were trained to teach physics and mathematics while the rest were trained in physics and chemistry. The combination of especially mathematics and physics must have influenced many students to associate physics with the different encounter in mathematics. Sixteen headteachers were trained to teach Art subjects while four were specialized in science subjects. Although one could have thought that all the science trained teachers were very competent in advising students on science subjects selection, only two were very confident of their competence.

Nineteen teachers had a teaching experience of 5 to 20 years. This implied that they had an excellent grasp of the physics subject matter and in addition identified topics that were difficult to students. Physics teachers have been attending SMASSE training mainly to improve their teaching skills and techniques. Therefore the connection between girls enrolment in physics and teachers professional training were ruled out. Physics teachers had relevant and adequate teaching skills.

In teaching and learning resources the researcher realized that the only girls schools were fully equipped with laboratories for each science subject. They also had extra rooms which were not used regularly. These schools had supply of

electricity and reliable water source (Supply). In co-educational schools they had a challenge on physical facilities. Some schools had no laboratories at all with few or no extra rooms. It was noted that no school had modern physics equipments such as Geiger matter tube for radio active radiation detection and the cathode ray oscilloscope meant for study of waves.

Attitude of the headteacher, physics teachers and female students proved to be positive. Many students were willing to take physics if it was not to be blocked with other subjects. Methods of teaching physics varied from one step to another. Some physics teachers did not supervise their practical lesson and ensure that all students participate. All students agreed that physics knowledge is to be known to all. They also agreed that a student should not be excellent in mathematics in order to do physics. 10 teachers agreed that physics oriented careers are equally suitable for both boys and girls while 8 teachers were undecided.

In guidance and counseling on career choice was most ineffective in most schools. The responses came across from all respondents. Most headteachers were not informed in career choices and their requirements. They were not aware of subjects combination in various careers. Most students were not aware on their career masters. Most of the schools missed career and guidance services in their schools.

### **5.3 Conclusion of the Study**

Professional training of teachers had no influence in female enrolment in physics in Kisumu district. This is because all teachers who were teaching physics were having diploma and above. This indicates that they had enough experience to handle the subject. They also had relevant and adequate teaching skills. The teachers were also attending SMASSE trainings to improve their skills. Subject selection as professionals was not free and fair. Most practical lessons were not supervised. Teachers who were teaching physics were only male teachers. The girls lacked role model. Teachers from co-educational schools had a negative attitude towards girls students. This was anti-professional practice

Girls only schools were well equipped with physical facilities for teaching and learning physics. They had laboratories for each science subject as well as extra rooms which were to enable them to enroll in all science subjects. This was not the case where the headteachers attributed girls enrolment in physics was due to inadequate teaching and learning facilities only. There might be other reasons. Some schools which had only one laboratory even enrolled more students in physics. The laboratories which were used to offer science subjects were to be used in physics. This implied that girls enrollment in physics can not be attributed to lack of physical facilities and teaching and learning resources.

All the respondents agreed that physics was basic requirement in the society that everyone needs to be with. Physics knowledge is needed of either



gender. To ensure gender equality and equity in high education and employment more girls should enroll in physics.

The findings indicated that any interested student in physics should be allowed to enroll regardless of the mark scored in forms 1 and 2. The underrepresentation to women and girls in science and technology negates the base of technology development in Kenya.

Career master and counseling contributes to female enrolment in physics in Kisumu district. From the findings most teachers are not aware of the career courses and subject combination. Some depended on the career masters who were also not active. Some depended on the headteachers who were also not informed. According to the responses this department was not effective. The enrolment of female students in Kisumu district was low as compared to that of the boys.

#### **5.4 Recommendations of the study**

Based on the findings and conclusions of the study, the researcher recommends the following:-

1. On professional training the government should endeavour at training and employing more female physics teachers in order to demystify the notion that physics related field is mainly a male domain. The government through the training institutions should establish a specified course on career master and counseling in all training institutions. Teachers who go through this course should specifically be posted to head career

departments in various schools. Therefore being an officially appointed head of department, the workload of the career counselor will be reduced and hence more time devoted to students affairs.

2. The physical facilities in the district are inadequate. This issue of inadequate laboratories, modern equipments, extra rooms should be given the first priority. All stakeholders should ensure that the number of laboratories in their schools should match the number enrolled in their schools. This will enable students to improve in the enrolment.
3. In order to cultivate more positive attitude in girls in physics, physics teachers should be gender sensitive and use teaching methods and strategies tailored to specifically encourage more girls to continue with physics. At the same time not discourage the boys. Physics teachers should show concerned and be physically present during physics practical to enable girls to fully participate, grasp and conceptualize both concrete and abstract concepts.
4. In career guidance, the government should ensure that teachers are trained on career choice not only in psychological counseling. This will empower the learners immediately they enter form one. This will make the learners to study with the objective. Students should not be forced to take a subject against their choice. The subject should not be blocked using other subjects like History, Geography, CRE which are darling to the girls. The

schools should prepare the learners on the availability of career masters and make them aware of the gain.

### **5.5 Suggestions for Further Study**

From the findings of this research, the researcher suggests that more studies should be carried on:-

1. In order to establish whether the factors that influence girls enrolment in physics are also affecting boys, a study should be done in boys only schools and co-educational schools.
2. In order to establish whether the factors that influence girls enrolment in physics in Kisumu district are affecting other districts in Kenya, a countrywide research study should be carried out.
3. A study should be carried out to establish why girls have a negative attitude towards mathematics and science subjects in mixed secondary schools.
4. A study should be carried out to establish why physics teachers in mixed secondary schools have a poor attitude to girl students and not boys.

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**APPENDICES**  
**APPENDIX I**  
**INTRODUCTION LETTER**

UNIVERSITY OF NAIROBI,  
DEPARTMENT OF EDUCATIONAL ADMINISTRATION AND PLANNING,  
P. O. BOX 92 – 00902,  
KIKUYU.

THE HEAD-TEACHER.....HIGH SCHOOL

Dear Sir/Madam,

**REF: PERMISSION TO COLLECT DATA IN YOUR SCHOOL**

I am a postgraduate student in The University of Nairobi, pursuing degree of Masters in Curriculum Studies. I am researching on school factors influencing low enrollment of female students in physics in public secondary schools in Kisumu district. Your school has been selected to participate in the research. You are requested to respond to the questionnaire items as honestly as possible and to the best of your knowledge. Thanks in advance for your cooperation,

Yours sincerely,

\_\_\_\_\_  
James N. Nyabengi.



## APPENDIX II

### QUESTIONNAIRE FOR THE HEADTEACHERS

This questionnaire is aimed at gathering information on school factors influencing low enrolment of female students in physics in public secondary schools in Kisumu District Kenya. The information given will be used for research purpose only and your identity will be confidential. Please respond to all questions. Don't indicate your name or the name of your school in the questioner.

#### Section A: Demographic data

Please tick (√) in the space provided or write as applicable where explanations are needed.

1. Please indicate your gender. Male  Female
2. What is your age bracket? 25 & below  26-30  31-40   
41-50  Above 50 years
3. Which subject combination did you take?  
.....
4. What is your highest professional qualification?  
.....
5. What is the type of your school?  
Girls only   
Co-educational (mixed)
6. Have your teachers of physics attended any physics in-service course on enrolment? Yes  No
7. In your school when students are choosing science subject combination what considerations takes first priority?  
A. Future career   
B. Overall grade in K.C.S.E
8. How many professional physics teachers do you have in your school?  
.....

9. (i) The guiders and masters in your school, are they trained?

Yes  No

(ii) If yes, what is their grade?

.....  
.....

(iii) What is the age bracket of your career master?

25 & below  26-30  31-40

41-50  Above 50 years

**SECTION C: Availability and utilization of resources**

10) What is your opinion about the facilities of teaching physics in your school? (a) Adequate (b) Inadequate

11) Do you have laboratories for the respective science subjects?

Yes  No

12) Do available physics resources influence the enrolment of girls in physics

(a) Yes (b) No

**SECTION D: Girls attitudes towards physics future careers?**

13) What do you think, should be done to encourage more girls to do physics?

.....

14) In your own opinion, do you think the millennium development goal of education and employment opportunities in both arts and science filed can be achieved? By 2015 and vision 2030?

**SECTION E: Career masterin subject selection**

15) Students in my school are properly counseled and guided in career prospects before selecting subjects in form three

- (a) Yes
- (b) No

16) The career department in my school is very effective

- (a) Yes
- (b) No

17. I do enlighten students on career oriented to my teaching subjects.

- (a) Yes
- (b) No

18. How are you always informed of the current job market demand?

.....  
.....

19. The career field is very dynamic, how do you ensure that you keep abreast with the latest and relevant career information?

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

20. How do you rate yourself in having the most current knowledge on the following areas: to be measured on three points scale

- (i) To great extent
- (ii) To some extent
- (iii) Not at all

	Statement	(i)	(ii)	(iii)
(a)	Careers associated with different science subjects combination			
(b)	Courses offered in tertiary colleges associated with various science subjects			
(c)	Courses offered in both public and private universities and cluster subjects required			
(d)	The current job market demand			
(e)	The remuneration expected in various careers			
(f)	The working conditions and terms of employment in different careers			

21. From your experience, why do you think girls prefer chemistry/biology and not physics combination?

.....  
 .....

22. In your own opinion, what measures should be put in place to encourage more girls to enroll in physics?

.....  
 .....

Thank you for your participation

**APPENDIX III**

**PHYSICS TEACHERS' QUESTIONNAIRE**

This questionnaire is aimed at gathering information on school factors influencing low enrolment of female students in physics in public secondary schools in Kisumu District Kenya. The information given will be used for research purpose only and your identity will be confidential. Please respond to all questions. Don't indicate your name or the name of your school in the questioner.

**Section A: Demographic data.**

Please tick in the space provided or write as applicable where explanations are needed.

1. Please indicate your gender. Male  Female
  
2. What is your age bracket? 25 & Below  26 – 30  31- 40   
41 – 50  Above 50
3. Which science subjects' combination do you take?  
.....  
.....

**Section B: Professional training of the teacher**

4. What is your highest professional qualification?.....
5. Who is your employer?.....
6. What is the type of your school?  
Girls only  Co-educational (Mixed)
- Did your initial professional training prepare you adequately to teach physics?  
Yes  No
7. Have you ever attended any physics in-service courses on low enrolment in physics? Yes  No

8. When students are choosing science subject combination, what consideration takes the first priority? (A) Future career prospects   
 (B) Overall grade in KCSE   
 (C) Any other (specify)

.....  
 Does your professionalism influence the enrolment of girls in physics subject?.....

**Section C: Availability and utilization of resources**

9. (i) What is your own opinion about the facilities of teaching physics in your school? (a) Adequate  (b) Inadequate   
 (ii) What are some of the consequences of your answer?

10. (i) Do you have laboratories for the respective science subjects?  
 (a) Yes  (b) No

(ii) How do you rate them with the modern technology?

11. Which type of audio visual resources do you use in teaching physics?

.....  
 12. Do the available physics subject resources influence the enrolment of girls in physics? (a) Yes  (b) No  . Comment

**Section D: Attitudes towards girls' future in physics oriented career**

13. You are given five alternatives depending on the extent of agreement. The alternatives are, Strongly agree (SA), Agree (A), Undecided (U), Disagree (D), Strongly disagree (SD)

Statement	SA	A	U	D	SD
Physics oriented careers are equally suitable for both boys and girls					

There is need for concern due to the small number of girls opting to do Physics					
A student need not to be excellent in Mathematics to do Physics					
In ensuring gender equality and equity in higher education and employment, more girls should enroll in Physics					
Any interested student in Physics should enroll regardless of marks scored in Form 1 &2					
Under representation of women and girls in science and technology negates the pace of technology development in Kenya					

14. What do you think should be done to encourage more girls to do Physics?

.....

15. Outline the methods you use in teaching in order of priority.

.....

16. In your own opinion, do you think the millennium development goals of education and employment opportunities in both arts and science fields can be achieved by 2015?

.....

**Section E: Career masterin subject allocation**

17. Students in my school are properly counseled and guided in career prospects before selecting subjects in form three. Yes  No

18. The career department in my school is very effective. Yes  No

19. I do enlighten students on career oriented to my teaching subjects.  
Yes  No

20. The process of selecting subjects in form three is free and fair.  
Yes  No

21. When do you think is appropriate time for students to do subject selection?.....

22. Are students encouraged to consult their parents or guardians regarding their subjects choice and future careers?      Yes        No   

23. How are you always informed of the current job market demand?  
 .....  
 .....

24. The career field is very dynamic, how do you ensure that you keep abreast with the latest and relevant career information? .....

.....  
 .....

25. How do you rate yourself in having the most current knowledge on the following areas: to be measured on three points scale

- (i) To great extent
- (ii) To some extent
- (iii) Not at all

	Statement	(i)	(ii)	(iii)
(a)	Careers associated with different science subjects combination			
(b)	Courses offered in tertiary colleges associated with various science subjects			
(c)	Courses offered in both public and private universities and cluster subjects required			
(d)	The current job market demand			
(e)	The remuneration expected in various careers			
(f)	The working conditions and terms of employment in different careers			

Thank you for your participation



## APPENDIX IV

### QUESTIONNAIRE FOR THE STUDENTS

This questionnaire is aimed at gathering information on school factors influencing low enrolment of female students in physics in public secondary schools in Kisumu District Kenya. The information given will be used for research purpose only and your identity will be confidential. Please respond to all questions. Don't indicate your name or the name of your school in the questioner.

#### Section A: Demographic data

Please tick (✓) in the space provided or write as applicable where explanations are needed.

1. Please indicate your gender. Boys  Girls
2. What is your age bracket? 14 & below  
15 – 17  18 – 21  Above 21 years
3. What is the type of your school?  
Girls only  Co-educational (Mixed)
4. Which science subjects' combination do you take?  
.....

#### Section B: Availability of teaching and learning resources.

5. Do you have a library in your school? Yes  No
6. How do you rate the stock of physics books in the library? Adequate   
Inadequate

7. Where do you conduct your physics practical lessons?  
 .....
8. Which teaching method is mostly used by physics teachers in form three and four:  
 Lecture  Demonstration  Question and answer  Discussion
9. (a) In your own opinion, do you think availability of physics resources contribute towards enrolment of physics? Yes  No   
 (b) Explain your answer in (a)  
 -----  
 \_\_\_\_\_

**Section C: Girls' attitude towards physics subject**

10. You are given five alternatives depending on the extent of agreement. The alternatives are, Strongly agree (SA), Agree (A), Undecided (U), (D)Strongly disagree (SD)

Statement	SA	A	U	D	SD
Physics is one of the useful subjects					
Everybody should have the basic Physics knowledge such as how to operate electrical appliances safely					
I enjoyed Physics lessons in Form 1 & 2					
Physics is the most difficult subjects among the three science subjects					
Girls understand Physics as well as boys					
There are many physics oriented careers where girls can fit.					
You do not need to be excellent in mathematics to do Physics					
Our head teacher was actively involved in teachers/students meeting in subject selection					

**Section E: Student aspired career and subject choice.**

11. Do you know your career master in the school? Yes  No

12. Do you have career master and counseling in your school?

Yes  No

13. Have you consulted the school counselor on career issues? Yes

No

14. What circumstances led you to choose the science subject combination

that you chose? Personal decision  Friend's Suggestion

Teacher/Career master recommendation  Parents recommendation

any other reason.

(Please specify).....

15. (a) When choosing your science subject combination, what consideration

will take the first priority? Future career prospects  My overall grade

in KCSE any other (Specify).....

(b) Explain your answer

.....  
.....

Thank you for your participation

## APPENDIX V

### LETTER OF AUTHORIZATION



#### NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone: +254-20-2213471,  
2241349, 310571, 2219420  
Fax: +254-20-318245, 318249  
Email: secretary@nacosti.go.ke  
Website: www.nacosti.go.ke  
When replying please quote

9<sup>th</sup> Floor, Utalii House  
Uhuru Highway  
P.O. Box 30623-00100  
NAIROBI-KENYA

Ref: No.

Date:

13<sup>th</sup> May, 2014

NACOSTI/P/14/1654/1504

Nyabengi Nyagaka James  
University of Nairobi  
P.O.Box 30197-00100  
NAIROBI.

#### RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on "*School factors influencing enrolment of female students in Physics in public secondary schools in Kisumu District, Kenya,*" I am pleased to inform you that you have been authorized to undertake research in **Kisumu County** for a period ending **31<sup>st</sup> July, 2014.**

You are advised to report to **the County Commissioner and the County Director of Education, Kisumu County** before embarking on the research project.

On completion of the research, you are expected to submit **two hard copies and one soft copy in pdf** of the research report/thesis to our office.

  
SAID HUSSEIN  
FOR: SECRETARY/CEO



Copy to:

The County Commissioner  
The County Director of Education  
Kisumu County.

*National Commission for Science, Technology and Innovation is ISO 9001:2008 Certified*

**APPENDIX VI**  
**RESEARCH PERMIT**

<p>THIS IS TO CERTIFY THAT <b>MR. NYABENGI NYAGAKA JAMES</b> of UNIVERSITY OF NAIROBI, 6386-40100 Kisumu, has been permitted to conduct <b>research in Kisumu County</b> on the topic: <b>SCHOOL FACTORS</b> <b>INFLUENCING ENROLLMENT OF FEMALE</b> <b>STUDENTS IN PHYSICS IN PUBLIC</b> <b>SECONDARY SCHOOLS IN KISUMU</b> <b>DISTRICT, KENYA</b> for the period ending: <b>31st July, 2014</b></p> <p><i>[Signature]</i> Applicant's Signature</p>	<p>Permit No. : <b>NACOSTI/P/14/1654/1504</b> Date Of Issue : <b>13th May, 2014</b> Fee Received : <b>ksh 1,000</b></p> <p><i>[Signature]</i> Full Secretary National Commission for Science, Technology &amp; Innovation</p>
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<p><b>CONDITIONS</b></p> <p>1. You must report to the County Commissioner and the County Education Officer of the area before embarking on your research. Failure to do that may lead to the cancellation of your permit.</p> <p>2. Government Officers will not be interviewed without prior appointment.</p> <p>3. No questionnaire will be used unless it has been approved.</p> <p>4. Excavation, filming and collection of biological specimens are subject to further permission from the relevant Government Ministries.</p> <p>5. You are required to submit at least two(2) hard copies and one(1) soft copy of your final report.</p> <p>6. The Government of Kenya reserves the right to modify the conditions of this permit including its cancellation without notice.</p>	<p style="text-align: center;"> <b>REPUBLIC OF KENYA</b></p> <p style="text-align: center;"> <b>NACOSTI</b> National Commission for Science, Technology and Innovation</p> <p style="text-align: center;"><b>RESEARCH CLEARANCE PERMIT</b></p> <p style="text-align: center;">Serial No. A: <b>1674</b></p> <p style="text-align: center;"><b>CONDITIONS: see back page</b></p>
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