

**FACTORS INFLUENCING SURVIVAL RATE OF FEMALE
STUDENTS' ENROLMENT IN PHYSICS SUBJECT IN PUBLIC
SECONDARY SCHOOLS IN KIRINYAGA CENTRAL DISTRICT,
KENYA**

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the Degree of Master of Education in Educational Planning
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DECLARATION

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

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DEDICATION

This project is dedicated to my wife Esther Wanjiku and my sons Wycliffe Macharia and Danielson Munene.

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I wish to thank our almighty God for the care, good health and his providence for the entire period of this study.

I recognize and appreciate a number of people, without whom this task could not have been accomplished

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ABBREVIATIONS

BOG	Board of Governors
CUEA	Catholic University of East Africa
EFA	Education for All
GAD	Gender and Development strategy
IPAR	Institute of Policy Analysis & Research
KCSE	Kenya Certificate of Secondary Education
MDG	Millennium Development Goal
MOEST	Ministry of Education Science and Technology
OSSREA	Organization for Social Science Research in Eastern and Southern Africa
PSE	Physics Self-Efficacy
QUASO	Quality Assurance and Standards Officer
SEPU	Science Equipment Production Unit
SMASSE	Strengthening of Mathematics and Science In Secondary Education
SPSS	Statistical Package for Social Sciences
STEM	Science, Technology, Engineering and Mathematics
UC	University College
UK	United Kingdom
UON	University of Nairobi
US	United States of America
WID	Women in Development strategy

ABSTRACT

This study was conducted to investigate factors influencing the survival rate of female students' enrolment in physics subject in public secondary schools in Kirinyaga Central District. The study was guided by four objectives. How the school policies influence female students' enrolment in physics subject, parents' influence on the enrolment of the female students' in physics subject, how the anticipated career placement affect the female students in enrolling in physics subject and how the teaching and practical aspect of the subject affects the female students' enrolling in physics. The study employed a descriptive survey design. All form three girls doing physics, physics teachers, career masters and principals in Kirinyaga Central District were targeted. A sample of 16 schools, 16 principals, 16 career masters, 16 physics teachers and 355 students were selected through simple random sampling to participate in the study. The data was collected by use of questionnaires, interview guide and check list. Data was analyzed using descriptive statistics by using the computer statistical package for the social sciences SPSS version 16 and Microsoft Excel. The study found that schools have policies that guide the subject selection. In most schools such policies don't allow the students choose subjects combination they may wish and are left to pick from the available alternatives offered by the school. It was very evident that the principals don't play an active role in supervising or guiding the students in the selection exercise and have delegated the work to dean of studies or class teachers. Though most schools had appointed career's master the department was found to be ineffective due to the fact that majority of those in the office had no formal training in the area. Parents were found very influential in assisting their daughters in subject selection. It was found that the level of involvement depended with the parents' level of education and the type of employment. The teaching methodology of physics subject was found to be more student-centered in co-educational institution than in girls' only institutions. The female students in co-education schools were found to be more comfortable in doing physics practical than those in girls' only schools. The enrolment in physics subject was found high in girls' only schools than in coeducation schools. Therefore it is recommended that the school administration formulate policies that give students freedom in subject selection so that they can achieve their career aspirations. Also more should be done towards training the career masters to match the current trends in labor and job market to give their students right and latest information regarding career

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Access to education promotes socio-economic, political and technological development world over (Republic of Kenya, 2005). Education provides essential skills which enable the recipients to sustainably create wealth and counter rampant poverty particularly in developing countries. Increased investment in education in terms of facilities and human resources is fundamental to the reduction of extreme poverty, empowerment of women as well as reduction of child and maternal mortality as reflected by the Millennium Development Goals (MDGs) (Republic of Kenya, 2005). The increase in investment in education should contribute to a higher survival rate in enrolment of girls in physics subject

Daily experiences of human beings in the 21st century are more and more being shaped by science and its applications. Science in daily life is viewed through the technological development in physical materials and modern way of doing things. Physics education therefore enables the learner to acquire problem-solving and decision-making skills that provides ways of thinking and inquiry which help them to respond to widespread and radical changes in industry, health, climatic changes, information technology and economic development (Changeiywo, 2007)

The teaching of Physics provides the learners with understanding, skills and scientific knowledge needed for scientific research, fostering technological and economic growth in the society, where they live thus improving the standards of living (Minishi, Muni, Okumu and Mutai, 2004). Physics education therefore should be a lifelong and recurrent, and not restricted to the stages of secondary school because issues will undoubtedly emerge during the coming decade (Adipo, 2007). Kenya needs to develop through science and technology education, a human resource capacity for rapid industrialization, which will ensure economic growth and sustainable development (Changeiywo, 2001). The Kenya government has targeted the goal of industrialization by the year 2020 (Republic of Kenya, 1996). This dream cannot be realized without the expansion of science and technology education in order to produce the required human resource. The advancement in technology cannot become reality unless the enrolment in physics and other sciences keep on improving across the gender.

Gacarira (2007) observed that it is indisputable that the scientific and technologies achievements of a society are major influence on the structure of that society and the physical environment in which it supports. He adds that the provision of such a base requires the education and training of a steady stream of highly trained scientists and technologists. The emphasis in science (physics) and technological growth forms the basic components of achieving vision 2030 hence cannot be under stated.

Gender disparity in education lowers the wellbeing of the society given that education has direct effects on human development (Wanaina, 2009). Globally women tend to be under-represented in science and technology. Internationally over the past decade (1990) pupil's interest and achievement in physics have steadily declined (Osborne and Collins, 2001). In United Kingdom the girls are under-represented in physics in post-16 level of education. They continue to make up of only 22% of those taking A-physics despite huge changes in the education system over the last 20 years. Physics is 19th most popular subject in Ireland in A-level with girls compared with 6th most popular for boys (Elywood and Murphy, 2004). The attitude of students towards science deteriorated from the later stages of primary school to the second year of secondary school the effect being more marked for girls in relation to physics subject. This shows that the international trend on the survival rate of females enrolling in physics has been on decline.

According to Hoffmann (2002) among the total number of Germany students in achievement course at upper secondary level at the gymnasium (high school) the number of girls who opt for physics is about 10%. Reid and Skryabina's (2002) study examined university students in Scotland studying physics and sought their views of what had influenced their choice of subject. Some 87% identified enjoyment of the subject in school as the main influence, followed by good grades (74%) and career opportunities (49%). These factors and their perceived influence are similar to those reported

by Sharp (2004), with the exception of teachers' enthusiasm for the subject, which teachers rated but students did not. In the survey teachers ranked perceived difficulty as the highest factor that discouraged take-up of science followed by negative subject image. The extent to which the students' family background was physics related the study found that nearly 60% of parents had little or no association with physics and the authors considered that this might create difficulties for students engaging with physics.

Krogh and Thomsen (2005) report on longitudinal study of physics in upper secondary schools was concerned with perceived barriers in the values and ways of being between 'life worlds' and 'school worlds' as a possible means of understanding attitudes and choice in relation to physics described four factors as potential barriers that students must experience; students' perception of the reputation of physics as strange, difficult, boring, etc. more than 50% of students had experienced this as a barrier; negative feelings about physics as a subject; the amount of home, peer and school support for students (most students reported favourably on the support available to them).

Zhu (2007) said that physics learning content in high school is far from been congruent with girls development of cognitive, psychological and social cognition. This incongruence contributes to the lower percentage of girls taking physics. The content is found to be abstract, mathematical and complex in concepts for easy understanding among the girls. Kwesiga (2002, 71-73) in a gender analysis of the enrolment rates in arts and science related courses in

higher education in sub-Saharan Africa observes that females prefer the arts as opposed to science subjects throughout the region. She attributed this bias to traditional social beliefs that sciences are masculine and hence a preserve for the males. Mboya (1998, 127-128) observes that, women have been historically under-represented in sciences in East Africa although there has been a gradual improvement in female enrolment in some institutions of higher learning and technical colleges. Mwayuli (2008) suggested that Kenya women scientists and engineers should come out strongly to change societal attitudes, influence policy, mentor and empower young girls to get into sciences and engineering.

In Kenya the choice of subjects is a common feature of the curriculum that affects the enrolment rates in different subjects. Students are allowed to make their preferred choices among the sciences at form two. According to Kaundia and Ihanga (2001) in their research on the advantages and opportunities of science and mathematics based careers for women, the secondary school education in Kenya should endeavor to direct students to different areas of specialization and level of operations through subjects taught in order to enable the society make full use of them.

The enrolment in physics by girls nationally has remained too low. This implies that to achieve the Millennium Development Goal of gender parity by 2015 as envisaged in the Dakar convention 2000 will remain a pipe dream unless urgent interventions are instituted to rectify the imbalance.

Various commissions and task forces have recommended different ways of

empowering the girl child education but the low rates of enrolment in physics has greatly affected the survival rate and hindered female participations in fields that are vital to the economy growth.

1.2 Statement of the Problem

As students move from form two to form three they are confronted by the problem of choosing from an array of available subjects. The available opportunities of subjects play an active role in the development of occupational and career aspiration of the students. Hence students are left to choose subjects that best suit them or those that have interest in. However girls have been traditionally underrepresented in the physical sciences compared to the fraction of the total population. This shows that the survival rate of those enrolling in physics has been on a downward trend among the girls. Statistics in the master plan on education and training in Kenya 1997-2010 indicates that females are adversely under-represented in science, mathematics and technology based courses both at university and other tertiary institutions. Recent findings show that students who hold negative stereotype images of science and technology in society are easily discouraged from pursuing scientific disciplines and performed poorly in science subjects (Changeiywo, 2000).

In Kirinyaga central district the situation has not been any better. In the 2011 KCSE results Kirinyaga County was the only one in the whole republic

where girls' enrolment was higher(51.8%) than the boys. The county has twenty girls' boarding schools as compared to ten boarding boys' schools. This has contributed largely to high number of girls in secondary school than boys amidst of other factors. The question that arises from such a background is why the enrolment of girls in physics in the County in the national exam KCSE has remained below par to the boys.

Table1.1 Students enrolment in Sciences KCSE exams in Kirinyaga District between 2008-2012

SUBJECT	GENDER	2008		2009		2010	
		F	%	F	%	F	%
BIOLOGY	BOYS	2318	43	754	42.2	697	43.2
	GIRLS	3072	57	1032	57.8	917	56.8
	TOTAL	5390	100	1786	100	1614	100
PHYSICS	BOYS	1610	71.1	315	70.5	466	68.6
	GIRLS	654	28.9	132	29.5	213	31.4
	TOTAL	2264	100	447	100	679	100
CHEMESTRY	BOYS	2959	49	976	48.6	888	48.3
	GIRLS	3078	51	1032	51.4	951	51.7
	TOTAL	6037	100	2008	100	1839	100

SUBJECT	GENDER	2011		2012		TOTAL	
		F	%	F	%	F	%
BIOLOGY	BOYS	832	41.2	851	40.7	5452	42.4
	GIRLS	1187	58.8	1213	59.3	7421	57.6
	TOTAL	2019	100	2089	100	12873	100
PHYSICS	BOYS	445	66.1	473	66.7	3309	69.4
	GIRLS	229	33.9	236	33.3	1464	30.6
	TOTAL	674	100	709	100	4773	100
CHEMESTRY	BOYS	1041	43.1	1167	48.3	7031	48.5
	GIRLS	1171	52.9	1248	51.7	7480	51.5
	TOTAL	2212	100	2415	100	14511	100

Source: MOEST DEO Office Kirinyaga District

The enrolments in year 2008 were for Kirinyaga District which has been divided into five districts from year 2009. What came out clear is that almost constant percentage enrolment rate (about 30.6%) has prevailed both for the region and the Kirinyaga Central District for those enrolled in physics. Therefore this study seeks to find out the factors influencing the female students' enrolment in physics subject at form three in Kirinyaga Central District.

1.3 The Purpose of the Study

The purpose of this study was to determine the factors influencing the survival rate of female students' enrolment in physics subject at form three.

1.4 The objectives of the study

- a) To examine how the school policies influence female students enrolment in physics subject at form three in public secondary schools in Kirinyaga Central District.
- b) To analyze parents' influence on the enrolment of the female students in physics subject at form three in secondary schools.
- c) To examine how the anticipated career placement affects the female students' enrollment in physics subject in public secondary schools.
- d) To determine how the practical aspect of the subject affects the female students' enrollment in physics at form three in public

secondary schools.

1.5 Research Questions

The following research questions were formulated to guide the study

- a) How do the school policies influence the enrolment in physics subject at form three by the female students' in Kirinyaga Central District?
- b) What role(s) do parents play in influencing their daughters towards the choice of physics subject at form three?
- c) How does the future career placement affect the female students in enrolling in physics subject at form three in public secondary school?
- d) How does the practical aspect of physics subject affect the female students in enrolling in physics subject at form three in public secondary school in Kirinyaga Central District?

1.6 Significance of the Study

The study aimed at establishing factors influencing the female students in enrolling in physics subject beyond form two levels in public secondary schools in Kirinyaga Central District. The findings of this study are expected to provide all educational stakeholders with a deep insight on factors leading to skewed enrollment in science subjects so that proper mitigation activities can be initiated. The findings from this study are expected to benefit the school managers, teachers and parents in realizing their critical role in influencing the

girls' participation in sciences at secondary school level. Consequently, the anticipated increase in girls' enrollment in Science, Technology, Engineering and Mathematics (STEM) courses will enable Kenya to achieve the goal of eliminating the gender disparities in education and employment by 2015 as envisaged in the Dakar convention 2000 and in one of the Millennium Development Goals (MDGs) and most importantly to achieve the Vision 2030.

This study will benefit the school managers especially the principals to become actively involved in subject selection to ensure students' are adequately sensitized on the consequences of their selection. The career departments in most school must become functional to equip the students with necessary knowledge that would help them make appropriate career choice.

1.7 Limitations

The researcher used the survey design. The information collected was limited to the extent at which the respondents volunteered the information. The researcher was not able to cover all the schools in the sample space due to limitation in finances and time. Transport and means of communication were a big challenge to access some schools that made the researcher fails to meet some appointments made with the principals for an interview.

1.8 Delimitations

The study was delimited to the public secondary schools in Kirinyaga Central District. The enrolment in physics at KCSE examination starts at the form three hence the target population for the study was students in form three. Among the so many factors determining the number of girls enrolling in physics the study only investigated the five stated in the objectives.

Due to differences in environmental, social, economic and political factors in different regions the findings and generalization of the study are limited to the study area.

1.9 Assumptions of the Study

The following were the assumptions for this study

- i. The respondents responded objectively without bias or prejudice
- ii. The entry marks at form one does not affect the enrollment at form three in physics subject

1.10 Definitions of Terms

Affirmative Action- Action taken in favour of a disadvantaged group so as to enhance equality

Blocking of Subject- refers to a situation where students are required to choose one subject in a provided combination and leave the others

Career –a job or series of related jobs you do especially a profession that you spend a lot of your working life in

Choice– the opportunity or right to choose from a set of alternatives available

Cluster- a small group of people or things that is very close to each other

Coeducational –Secondary school where boys and girls learn together

Core – the most important or most basic part of something

Curriculum – the subjects that student study at a particular school or college

Enrolment – process of registering in an official list to become part of

Gender– the fact of being either male or female

Intervention– an action of getting involved in a situation in order to try to stop or change it

Performance – the standard to which someone does something; the extent of achieving the desired goals and objectives

Physics-The study of matter in relation to energy

Practical aspect-The dimension of applying theoretical facts practically

Selection – the process of choosing one person or a thing from a group

Self-Efficacy-one's perceived capabilities for learning or performing actions at designated level

Students' participation-the involvement of students on issues that affect them so as to make a decision that well incorporates their views

Survival rate-a measure of determining the number still existing after students have been given alternative to choose otherwise

Technology –Arts, skill and applicationof knowledge in performing a task or work designed in an improved scientific method

1.11 Organization of the study

The studyisorganized into five chapters. The first chapter presents general introduction which consists of the background of the study,statement of the problem,purpose of the study, objectives, research questions, and significance of the study, limitations and delimitationsof the study, research assumptions and definitions of terms. Chapter two comprises of literature review based on the objectives,the variables of this study, theoretical framework and the conceptual framework. Chapter three focuses on the methodology of the study which consist of research design, the target population, sample and sampling procedures, research instruments, instruments validity and reliability, data collection procedures and data analyses techniques. Chapter four presents description of analysis and interpretations of the research findings.Chapter five provides a summary of findings,discussions, conclusions and suggestions for further research.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter contains review of books, policy papers, research works and other literary works related to the factors that influence the female students' enrolment in physics at form three in public secondary schools.

The review has been done under the themes:-how the school policies influence the female students' enrolment in physics, the role parents play in influencing their children in choosing of physics subject at secondary schools, how the anticipated career placements influence female students in enrolling in given subject at form three and how the practical aspect of the physics subject affects the enrolment of female students in subject.

2.2 Enrollment of Female Students in Physics

The problem of student's performance in science and low enrolment rates in physics has attracted many research studies some which include by Orodho (1996), Angora (2003), Muli (2005), Njiru(2007). They mainly focused on identifying factors hindering achievement in science subjects among boys and girls and especially physics. Kireria(2007) investigated the factors influencing form two students in their choices of optional subjects. Kageema(2005) did a study on low enrolment in physics in secondary schools in Maragua District

for both boys and girls.

Studies specifically done on girls low enrolment in physics includes those done by Musyoka(2000), Manguti (2004),Munyalo (2006),Gacarira(2007) and Mwangi (2009).The studies by Mwangi (2009)concluded that the low enrolment of girls in physics in Murang'a North District is affected by factors such as girls attitudes towards physics, the career guidance and counseling services in a school, theteachers related factors and the role of school administrators. Gacarira (2007)found out that the enrolment of girls in physics depends on factors identified by the other studies which include:-the effect of coeducations, lack of role models, peer influence, and inadequate teaching facilities as some of the hindrances to girls' participation in physics. These factors are quite different from which this study investigated.Most of these studies have identified several recommendations aimed at increasingthe number of girls in physics.Musyoka (2000) 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 it is important that they experience themselves as competent in the subject. Teachers need to monitor students' views of themselves as competent learners of physics.

This study did more research on some of these recommendations.

Followingthose recommendations single sex schoolsare on increase in the country and many girls schools have benefited from government provision of

construction of classes and laboratories and purchasing of equipment and learning materials through the Economic Stimulus Programme (Chege and Sifuna, 2006).

2.3 The School Policies on enrolment of students in optional subjects

The head of school is in charge of all that goes on in the school ranging from human resource management, financial management, curriculum implementation and policy formation and implementation (Mbiti, 2007).

A Head teacher interprets the policy on behalf of the government, executes curriculum programmes, ensures provision of equipment and physical facilities and maintains effective school communications relations. In recent times due to scarce resources and cost of living shooting up (inflation) schools are coming up with strategic plans that will guide them in the present and future directions of operations of schools to become effective in utilization of resources.

The policy the school adopts goes a long way of deciding academic programs and the future expansion of school. In many school policies the academic department is mandated to conduct the form three students' selection exercise after ensuring that the curriculum requirements have been understood by all students. However the stage at which the students make their choices varies from one school to the other and in most cases this contravenes the

ministry policy that selection must be done at the end of form two courses. Some schools allow their students to make their choices as early as after first term in form two, others after second term and others after the third term. This implies that students are not subjected to the same content of physics subject when making their choice. Hence there are varied perceptions of subject depending on what extent of the content was covered before the time of selection. A number of past research studies Manguti (2004), Munyalo (2006) and Gacarira (2007) revealed that the process of subject selection is an area where the students' are not fully involved but rather hurriedly coerced into subjects choices either to balance the classes, to limit the number due to facilities, or reduce the cost.

The school policies either enhance the enrolment or limit the enrolment in physics. There are cases where physics is blocked with a humanity subject like CRE or History or with another science in the time-table. This complicates the student's choice as one has to pick just one subject in the block and in most cases physics is the least popular.

2.4 Anticipated Science based Career on student's choice of subjects

The information that young people receive about possible careers will influence their decision making. Semple and Hawieson (2002) found out that information from close friendship groups; boyfriends and girlfriends have considerable influence in the aspirations of young people particularly in the

case of continued education and training. However they also found that the accuracy of the information provided by the informal networks was sometimes questionable in a rapidly changing labour market. Hence information can be misleading as far as educating the young people the future prospects of some careers.

An article in a Saturday Nation March 4, 2006 by Aduda page 16 summed up the challenges students face in career guidance in schools, "Due to the shortage of teachers most schools don't have a career department. Even where such departments are established the teacher manning them is usually under a lot of pressure for he has to cope with his teaching load on top of having to advise the school about the choice of careers. He is given very little time say 40 minutes per week in which to deal with matters pertaining to careers. Such a teacher will most likely have no formal training in this area and due to lack of time and money never attends in-services courses and/or seminars."

This means that the students are not well advised thoroughly on career choices because the teachers entrusted with the department either are not properly skilled or lack enough time for the exercise. The students hence select the subject's from popular perceptions rather than from point of knowledge. Hence the enrolment rate in physics subject among the girls is negatively affected.

A study by Francis (2002) on 14-16 year olds in London on career prospects found that both boys and girls had little knowledge about the adult

workplace because the career guidance provided by the teachers didn't have accurate knowledge of the employment market or information about a particular career. Several studies sponsored by world bank such as the one carried by Davidson and Kanyaka(1992) and Long and Fofanah(1990) showed that children in urban areas displayed a wide range of career aspirations than those residing in rural areas especially female students. Other studies done by Kibera(1993) who carried a survey on career aspirations and expectations of secondary school students in Kajiando, Kiambu and Machakos Districts in Kenya found that male students have a higher educational and occupational aspiration than the females.

Job attitudes of girls differed with those of boys'. Girls largely preferred service jobs involving working with people than working with things while boys preferred scientific fields. These orientations form the basis in which the girls choose their sciences from to suit the aspirations. The service jobs preferred by girls do not require physics subject as core in their admission hence the girls are not motivated to choose physics subject.

2.5 Parental Influence on choice of physics

Wahl and Brackhurst(2000) indicated that children's career aspirations were more closely related to parental occupations. Among the adolescent females in particular career choice was strongly influenced by the mother's occupation. The mothers played as the role models in the development of their

daughter's career goals and aspirations. Tinklin, Croxford, Ducklin and Frame (2005) observed that women tended to enter the workforce of lower-status, lower-paying job, less demanding jobs and remained clustered in a limited number of conventional careers like secretaries, sales, services delivery, nursing, teaching, social workers and clerical jobs where physics is not required. Signer's and Saldana's (2001) study found out that the social status of mothers as opposed to the social status of the father had stronger correlation with the social status of female students career aspirations.

A multivariate analysis between a father's education level and a mother's education level and a girl's education experience done by Kanga (2005) revealed that a father's educational level influenced girls' education opportunities more positively than the mother's education level. The fathers who are in physics related careers influence their daughters positively towards choosing physics subject. In Africa the deeply rooted patriarchal setting especially in rural areas has greatly perpetuated the perception of father position as the source of ultimate family director and benefactor. Negative attitudes from parents have been a major cause of low enrolments and dropouts in sciences. This is because traditional belief segregated roles along gender lines, most parents have not accepted the need to equip girls with skills and knowledge through education to enable them to function effectively in modern world, Ogeto (2008). Girls are seen like they can only fit in less challenging careers where physics is not a requirement.

Both parents hence have a role to play in influencing their daughter's towards the desired subject choice to make them get fully integrated in rapidly changing technology of our economy. Parents have to encourage the girls' select physics subject in order to enroll in first developing science courses.

2.6 The abstraction and complexity of physics concepts on female students

Studies by Murphy and Whitelegg (2006) from Britain and Germany found that students decline interests in sciences although the age at which this begins is not consistent across the studies. Many involved in the studies say the decline in interests results from the growing abstraction and complexity of subject hence they don't enjoy it and would not pursue it any further or consider it as a career.

Musyoka(2000) found that the majority of the students who were not taking physics were scared by its quantitative nature and its nature of being too abstract especially when it's taught theoretically. Krogh and Thomsen's(2005) found that if physics is presented in the context of abstract school activities then many students have to make their own bridges to fill on the gaps in order to create personal meaning in school tasks. Failure to make these bridges is more problematic for girls than for boys.

According to Adipo(2007)the image of difficult could prevent students from choosing physics because of lowered expectation of success resulting in a fear of getting bad grades and at the same time a fear of revealing a lack of

intelligence if the student should fail the subject. Angell (2004) described physics as demanding and labour intensive. The grade 12 pupils involved in the study said that part of the trouble was often due to the fact that in physics understanding was essential as opposed to other subjects where rote learning are necessary and sufficient. According to Changeiwo (2000) the students should be encouraged to perform physics experiments individually or in groups and be placed in situations that they can generalize and deduce. He further said that the hands on practical work by students are important since it ensures learning science by doing rather than merely learning about it demystifying the subject. The concepts would be applied hence attaching practical meaning for easy comprehension. Tsuma (1998) pointed that a science laboratory is an indispensable facility in science education. If equipped with the relevant apparatus the laboratories provides the best setting for teachers to assist students in acquiring the scientific knowledge process skills and attitudes.

2.7 Summary

In the literature review we have found out that choice of science subject is dependent on many other factors. Kireria (2007) brought out the lack of role models among the female who have excelled in sciences while Musyoka (2000) and Munguti (2004) highlighted the peer influence, co-education of boys and girls and inadequate teaching facilities as some of the hindrances affecting the choice of physics subject among the girls. Kagema (2005) found

that the teachers' related factors contribute significantly on the number enrolling in physics subject. Mwangi (2009) in his study considered factors like girls attitudes towards physics, career guidance and counseling services and the role of school administrators in affecting the girls' enrolment in physics. However these studies didn't examine the factors like the role of parent, the career dream of the student, the school policies on enrolment and the nature of physics subject which this study aim to determine on how they affect the enrolment in physics among the female students.

2.8 Theoretical Frame Work

This study is based on rational decision making theory. The major proponent of this theory was Gary Becker (1974). It is a method of systematically selecting among possible choices that is based on reason and facts. In this theory the process of decision making involves analyzing a number of possible alternatives from different scenarios before selecting a final choice. The decision making is a logical, systematic process consisting sequence of steps designed to rationally develop desired solutions. It assumes that individuals always make prudent and logical decisions that provide them with the greatest benefit or satisfaction and that are in their highest self-interest.

A girl in form two must make a decision on what science subjects to enroll in form three. According to this model the girl needs to know that at form two it's where the opportunity for choice is available. Secondly she has

to gather a lot of information on what each subject entails and future prospects of the subject. This means involving her parents, subject teachers, career masters, and other important stakeholders. Armed with this information she needs to analyze what each of them mean and develop some options of likely suitable subject combination. Finally she makes her preferred choice of the combination to take which is agreeable to all others involved. Therefore she makes her choice having evaluated exhaustively the benefits and consequences of different course of action

One of the critics of this theory was Hebert Simon (1978) a Nobel Prize winner who argued that human beings are not entirely rational calculating machines. He said that our rationality is bounded by our own cognitive capabilities. Hence we tend not to optimize our decisions as assumed by rational decision making theory but rather satisfy them. Not many students sit down and work out a way of making decision. They find themselves having made a decision without necessary accounting how it has been arrived.

The main strength of a rational decision making model is that it provides structure and discipline to the decision making process. It helps ensure we consider the full range of factors relating to a decision, in a logical and comprehensive manner.

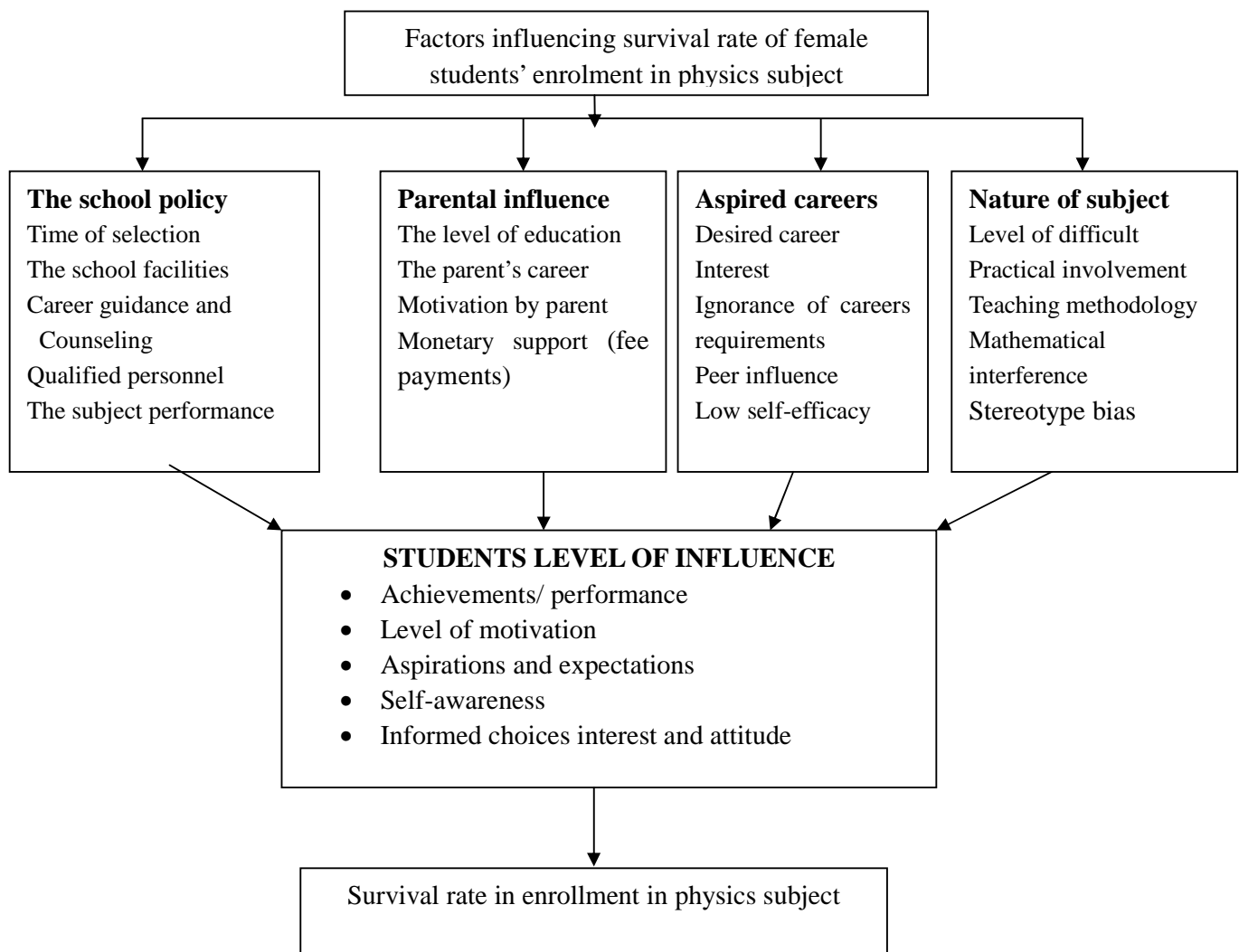
2.9 Conceptual Frame Work

A conceptual framework is a model of presentation where a researcher represents the relationship between variables in the study and shows the

relationship either graphically or diagrammatically Orodho(2004).

The figure 2.1 shows the relationship between the study objectives and how they influence the female students towards the number enrolling in physics subject at form three.

Figure 2.1 Conceptual Frameworks of Factors Influencing the survival rate in enrolment among the female students' in physics



There are various inputs that influence the girls' selection of the science subject at form three. The figure 2.1 shows the inputs and the way they interplay in influencing the female students' choice of physics subject.

The girls' choice of physics subject is dependent on a number of independent factors. The factors are the inputs that influence the girls' decision in making selection of the sciences. The inputs form the environment that shapes or guide the individual characteristics which determine the basis of decision making. The female students receive the stated inputs, process them and then make a decision whether to enroll in subject or not. The female student decision to enroll in physics subject is influenced by the four inputs that have been the objectives of this study. The process of making decision by the student is guided by the achievement or performance in physics subject, the level of motivation to continue with the subject, the future career aspiration associated with physics subject and the interest and attitude towards the subject. The decision made determines the number enrolling in physics subject at form three. Hence the figure 2.1 shows how the different elements in the stated objectives affect the survival rate of the females' enrolment in physics subject.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

The chapter describes the research methodology that was adopted for this study in order to collect the necessary data. The chapter is organized under the following subsections: research design, study locale, target population, sample size and sampling procedures, data collection instruments, validity and reliability of research instruments, data collection procedures and data analysis techniques.

3.2 Research Design

The study employed a descriptive survey design. According to Fraenkel and Wallen(2000), a descriptive survey collects information from sample that has been drawn from a predetermined population. This research design was chosen because the researcher only intended to gather data on existing state of affairs in the target population without manipulating any variables.

3.3 Target Population

The target population refers to the total number of subjects or the total environment of interest to the researcher (Oso and Onen, 2005). Kirinyaga Central District is one constituency with three wards namely:-Mutira Inoi and Koroma. It has 30 secondary schools: 6 county schools, 4 district boarding schools, 16 district day schools and 4 private schools with a total population of 2055 students by 2012. The private schools were not covered by the study. From the 26 remaining schools, girls' only schools are 6, boys only schools are

3 and the rest 17 are co-education. All the girls' only schools are boarding. The target population comprised the 23 schools which were either girls' only or co-educational. From the targeted schools the respondents were, the principals, the physics teachers, the career masters, the laboratory technicians' and the physics students.

3.4 Sampling and Sampling Techniques

According to Fraenkel and Wallen (2000), a sample is a group from which information is obtained. They further defined sampling as a process of selecting a number of individuals from a population.

Stratified and simple random sampling techniques were used to select the schools and students to participate in the study. Stratified sampling ensured that there was a school in each of the 3 divisions (wards) in the sample. The schools in each of the division were then stratified as either girls only or co-educational. The sampled schools in the three divisions were distributed as the table below.

Table 3.1 Schools Sample Distribution

Division	Girls Only Schools	Co-Educational Schools	Total
Mutira	2	3	5
Inoi	3	4	7
Koroma	1	3	4
Total	6	10	16

The sample of 10 coeducational schools represented 58.8% of all coeducational schools in the district while the 6 girls' only schools was 100 % representation.

From the 16 sampled schools the researcher aimed to interview all the principals and administer questionnaires to one physics teacher in each school, the career master and at most 20 students in each school.

3.5 Research Instruments

The researcher used 3 types of research instruments: interview guide, questionnaires and check list. According to Best and Khan (2000), interview method of collecting data is often seen to be superior to the other instruments in that it creates rapport between the respondent and the researcher. A semi structured interview guide was used to collect data from the principals. Kothari (2005) describes a semi structured interview as one which involves not only the use of a set of predetermined questions but also includes some questions which can generate varied responses from interviewees.

Section A sought the biographic data of the respondent while section B gathered information from questions based on the four objectives of the study. (See appendix A). The biggest challenge the researcher faced was some principal could not honor the appointment set for the interview resulting to only 10 participating. Kothari (2005) considers questionnaires as the heart of a survey operation. Uses of questionnaires allow greater uniformity in the way questions are asked and hence ensuring comparability in the process Mouly(1988). The study used questionnaires to collect the data from the students, physics teachers and the career masters. The questionnaires had both open and close ended items to gather information and opinions from

respondents.

This questionnaire had three sections. Section A sought the demographic information: section B sought information on attitudes towards girls' future in physics oriented careers and section C sought information on science subject selection. (See appendix B). This questionnaire had two sections. Section A sought the demographic information while section B sought information on subject selection. (See appendix C). This questionnaire consisted of six sections. Section A sought information on student's demographic data: section B on student's perceptions and experiences of subject selection exercise: section C on student's aspired career and subject choices: section D on parental influence: section E on the practical nature of the subject and section F on the school policy regarding subject selection. (See Appendix D)

In order to establish the capacity to offer physics practical effectively the researcher used check list to determine availability of most essential equipment in the laboratory. The researcher was assisted by the laboratory technicians in analyzing the available equipment through the permission from the head of science department.

(See Appendix E)

3.5.1 Validity of Research Instruments

Validity is the extent to which an instrument achieves the purpose for which it was designed for Wiersma(1995).The researcher consulted the supervisors who validated and enhanced the value and content of the research instruments.

The pilot study helped the researcher in improving the face validity and content validity of the instruments. Any itemthat was found to be ambiguous in eliciting relevant information was modified and restructured.

3.5.2 Reliability of Research Instruments

Reliability of an instrument concerns the degree to which a particularinstrument can consistently yield a similar result over a number of repeated trials Orodho(2005). Kothari (2004) stress that reliability of an instrument can be assessed by assessing such issues as who to collect the data, sources of data and proper methods to be used. To ensure reliability of research instruments the test-retest method involving administering the same instrument twice to the same group of respondents with time lapse between the first and second test of one week was done with two schools not involved in the final study.

Two principals, two physics teachers, two career masters and twenty students filled the questionnaires and after a period of one week the same questionnaire were re –administered to the same group. The two set of data were correlated using SPSS version 16. The spearman reliability coefficient

for principals, physics teachers, career masters and students were calculated using the formula below and found to be as per table 3.2

$$r = \frac{N \sum XY - \sum X \sum Y}{\sqrt{N[\sum X^2 - (\sum X)^2] [\sum Y^2 - (\sum Y)^2]}}$$

Where X- first test Y-second test

Table 3.2 Summary of reliability tests results

Respondents	N of Cases	N of Items	r
Principals	2	15	0.8537
Physics teachers	2	15	0.8219
Career Masters	2	16	0.7954
Students	20	21	0.7768

According to Berthoud (2000) a reliability coefficient of 0.6 and above is satisfactory for any research instrument. The researcher edited some few parts of career masters and students questionnaires and used them to collect data from sampled schools.

3.8 Data Collection Procedure

A research permit was obtained from the National Council of Science and Technology (NCST). A copy of permit was presented to the DEO Kirinyaga Central District and the County commissioner Kirinyaga. Data was collected by the researcher administering instruments to the physics teachers, career masters and students in person. Though the researcher wished to interview 16 principals he was only able to meet 10. The researcher was able to meet the physics teachers in the schools visited who assisted him to identify the students. The students were randomly selected from the group of students doing physics at form three.

However for the schools that had already selected the subject at form two the students were randomly selected from form two and form three students who had selected physics subject. The researcher met the students and explained to them on the questionnaire before they were given to fill. The researcher with assistance of subject teachers ensured that the students filled the questionnaire individually without discussing or consulting each other. The career masters were given the questionnaire which was collected the next day because some were not found in school by the researcher. The researcher filled the observation schedule guided by the laboratory technician. Where not possible the laboratory technician were given the document analysis to fill and collected the next day.

3.9 Data Analysis Techniques

The raw data collected from the questionnaires were coded, organized and analyzed using descriptive statistics. Descriptive statistics such as frequencies, percentages, measure of central tendencies and graphics was used.

Qualitative data derived from open ended questionnaires and the information from the interview was grouped into various themes according to the objectives and coded. The researcher used analysis tools Microsoft Excel 2007 and the statistical package for social sciences (SPSS version 16) to analyze the data. From the analysis the researcher interpreted the data, made inferences and conclusions, and gave the recommendations.

CHAPTER FOUR

DATA PRESENTATION AND ANALYSIS

4.1 Introduction

This chapter deals with the presentation of data collected from the field and methods employed in data analysis to arrive at the answers to the research questions of the research. The research questions were derived from four objectives of the study.

4.2 Questionnaire return rate

Questionnaire return rate is the proportion of the sample that participated as intended in all research procedures. Out of 16 sampled principals 10(62.5 %) participated in the interview. All the 16 sampled physics teachers 100% returned the questionnaires. Out of 16 sampled career masters 14 (87.5%) returned the questionnaires. Out of 355 sampled female students 308 (86.8%) returned the questionnaires. The data analysis procedures to answer each of the research questions are discussed below.

4.3 Demographic information of the participants

The section focuses on the demographic information of the respondents that participated in the study.

4.3.1 Gender of participants

The demographic information of principals was based on gender, age, qualification level, teaching subject and teaching experience.

Table 4.1 Gender of the respondents

	Male		Female		Total	%
	Frequency	%	Frequency	%		
Principals	0	0	10	100	10	100
Physicsteachers	10	62.5	6	37.5	16	100
Career masters	11	78.57	3	21.43	14	100
Students	0	0	308	100	308	100

The data on gender table 4.1 showed that of all schools sampled (mono and co-educational) the principals were all females (100%). This shows that the female are over represented in management levels of school. The question on gender was to determine whether girls get the opportunity to be guided by both female and male teachers about the future career. The low percentage (37.5%) of number of female teachers has a negative influence on girls' enrollment in physics because they lack a role model in terms of gender. The gender information of career masters raised more questions than answers. Eleven (78.57%) of career masters are males and having that the highest return rate came from girls only schools (57.28%) it implies that the career departments in both types of school are handled by male teachers.

4.3.2 Age of participants

The tables below show the age distribution of participants.

Table 4.2 Age distribution of students

Age	F	%
Below 14 yrs	5	1.62
15-17	216	70.13
18-25	87	28.25
Total	308	100

From table 4.2 the 70.13% of girls sampled are in the age bracket of 15-17 years and therefore capable of making informed decision on their preferred subjects. It is further noted that more girls aged above 15 years are in coeducational schools at 51.62% compared with 47.41% in girls' only schools.

Table 4.3 Age distribution of the teachers

	Principals		Physics teachers		Career masters	
	F	%	F	%	F	%
18-30	0	0	2	12.5	0	0
31-40	0	0	3	18.75	0	0
41-50	3	30	4	25	5	35.71
>50	7	70	7	43.75	9	64.29
Total	10	100	16	100	14	100

From the table 4.3, eleven (68.75%) of physics teachers were above 40 years

indicating that the majority are mature and experienced in teaching the subject.

Both the principals and career masters were found to be above 40 years of age hence having enough experience to perform their duties effectively.

4.3.3 Qualification of participants

Professional and academic qualifications determine the effectiveness of teachers (Okumbe, 1999). The researcher sought the qualification of the principals, physics teachers, and career masters to establish whether they are qualified to carry out their responsibilities successfully. The data regarding academic qualification is presented in the table 4.4

Table 4.4 Qualification of participants

	Principals		Physics teachers		Career masters	
	F	%	F	%	F	%
Diploma	0	0	2	12.5	3	21.43
Degree	6	60	5	31.25	8	57.14
Masters	4	40	9	56.25	3	21.43
	10	100	16	100	14	100

From the data as seen on table 4.4 100% of principals interviewed had a qualification of Bachelor degree and above. This means that they all had the basic skills in management.

The aspect that (56.25%) of physics teachers had a master qualification proves that the teachers are knowledgeable in subject matter and well versed in international trends in education hence in a good position to guide the

students.100% of career masters agreed that they had no formal training in career guidance.

4.3.4 Experience of participants

The teaching experience to a larger extent determines the effectiveness of teachers (Cheryll & Rebecca, 2006). Physics teachers and career counselors who have worked and interacted with students for long are well versed with students perceived problems in physics as a subject and physics oriented careers. The table below shows the extent of experience of the participants.

Table 4.5 experience of participants

	Principals		Physics teachers		Career masters	
	F	%	F	%	F	%
Below 5yrs	0	0	1	6.25	0	0
6-10yrs	2	20	2	12.5	2	14.29
11-15yrs	3	30	4	25	4	28.57
>15 yrs	5	50	9	56.25	8	57.14
Totals	10	100	16	100	14	100

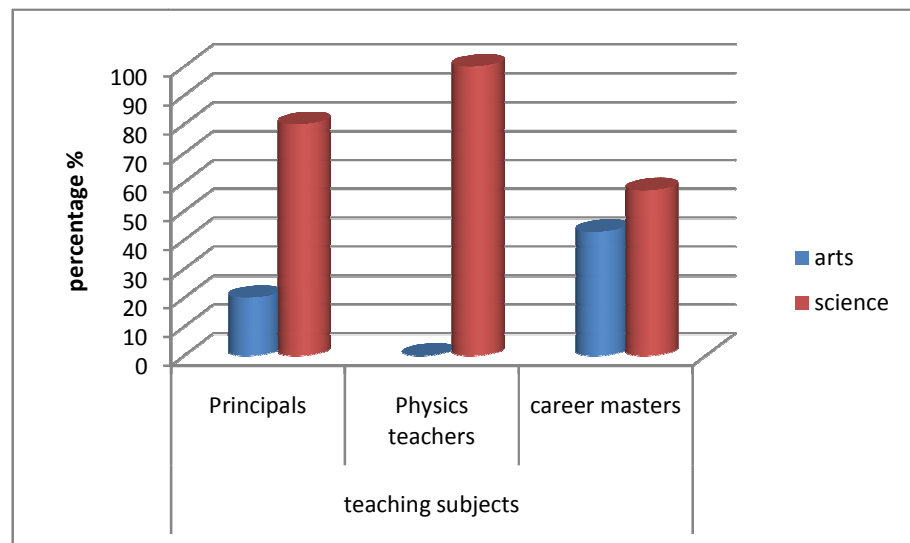
From the table 4.5, 81.25% of the physics teachers had a teaching experience of more than 10 years. Though the majority of the career masters had experience of more than 5 years, experience in teaching may not translate to effective career guidance and counseling qualification.

4.3.5 Subject combination of participants

The researcher sought information on the two subjects in which both teachers and the principals were professionally trained to teach. For the purpose of this study the subject were categorized into two:

Arts consisted languages and humanities subjects while sciences comprised of mathematics sciences and technical subjects. The figure below shows the subject combination of the participants.

Figure 4.1 Teaching Subjects



From the figure 4.1, 80% of the principal interviewed did science courses. Similarly 57.14% of career masters were science teachers hence it is assumed they may have basic knowledge on science based careers to guide the students accordingly.

The researcher wanted to know which science combination was more popular with girls. He sought the information whether the student was doing two or three sciences which physics was one of the subjects in either case. The table below shows the combination.

Table 4.6 Girls science combination including physics

		Frequency	Percentage %
3 sciences	Girls only	56	18.18
	Mixed	54	17.54
2 sciences	Girls only	108	35.06
	Mixed	90	29.22
Total		308	100

From the table 4.6, very few girls have enrolled in three sciences in both categories at 35.72% an average of 17.86% per category. Girls in girls' only schools were more popular in physics at 35.06% compared to 29.22% in coeducation schools.

Therefore it's important to enlighten the young girls in schools that unlike the past the present career arena is open to all regardless of gender.

4.4 School policies influence in enrolment in physics subject at form three.

The policies of any school are formulated by the management team and executed by the principals. From the research finding the number of female students enrolled in physics was found to be very low. The average percentage of girls enrolled in physics at form three in schools under study was found to be 27.79%.

The following questions helped the researcher investigate the objective stated.

4.4.1 Rules and policies directing subject selection

The table below shows the responses of the principals and students on whether their schools have rules and policies directing subject selection.

Table 4.7 Rules directing subject selection

		YES		NO	
		F	%	F	%
Principals		8	80	2	20
Students	Girls only	88	60.27	58	39.73
	Mixed	69	42.59	93	57.41

From the table 4.7, 80% of principals agreed that there were set rules guiding subject selection. Some of these rules included:

Students chose subject according to already defined combination. For the students doing physics they had to choose from the three sciences or physics and chemistry combination. No school was offering physics, biology combination. Another reason was that physics was blocked with non –science subject. Students were asked if physics was blocked with non-science subject: 42.53% said Yes while 57.47% said No. The school policy of blocking physics with non-science subject hence affect the number of students enrolling in physics in that many opts for the non-science.

4.4.2 Level of agreement on some chosen statement about subject choice

The responses were coded on a likert scale of 1 to 5 where 1 is a code for strongly agree 2 for agree 3 for undecided 4for disagree 5 for strongly disagree. For purposes of simplifying computation of data 1 and 2 were combined to indicate positive agreement with the statement, 3 to indicate indecision and 4 and 5 combined to indicate disagreement with the statement

Table 4.8 Student responses to subject selection

STATEMENT	Agreement		Undecided		Disagreement	
	F	%	F	%	F	%
There was a limit of number of students to be in physics class	86	36	0	0	153	64.02
The subject Selection exercise was free and fair	232	95	2	0.82	10	4.09
Students were well guided on how to make choice of their interest	216	90.4	3	1.25	20	8.37
There was freedom to take the three sciences subjects	136	56.9	3	1.25	100	41.84
Physics students were selected depending on interest	45	18.8	4	1.67	195	81.25
Our career master offeredadvice on how to choose Sciencesubjects	190	79.5	2	0.82	47	19.67
Our head-teacher Offered advice on how to choose science	76	32.6	8	3.86	149	63.95

It's important to note from the table 4.8 that a good percentage of 95% of students agreed that the selection exercise was free and fair, 64.02% no limit was set for number of students to be in physics class and the performance in mathematics was not a factor in physics selection 81.25%. However on the freedom of choosing three sciences the students could not agree significantly.

This finding goes against Magiri (1997) and Munyalo (2006) who found that the performance in mathematics was in a big way used as criterion of choosing who to enroll in physics.

There is high percentage of 63.95% showing that the principals do not actively participate in subject selection. This shows that the exercise of subject selection has been left in the hands of academic masters who decide when the subject selection was to be done, which optional subject to be made compulsory and the science subject combination to be offered in the school.

This finding agrees with Mwangi (2009) who found that the principals laxity in providing appropriate direction and leadership in students subjects selection has provided impetus to different teachers self-made criteria to which students must adhere to in order to enroll in their subject.

The researcher observed that in all school visited they had functional well equipped laboratories with qualified technicians. This showed that all schools visited gave science due importance to enable effective teaching of sciences

4.5 Parents and their influence towards the choice of physics subject at form three

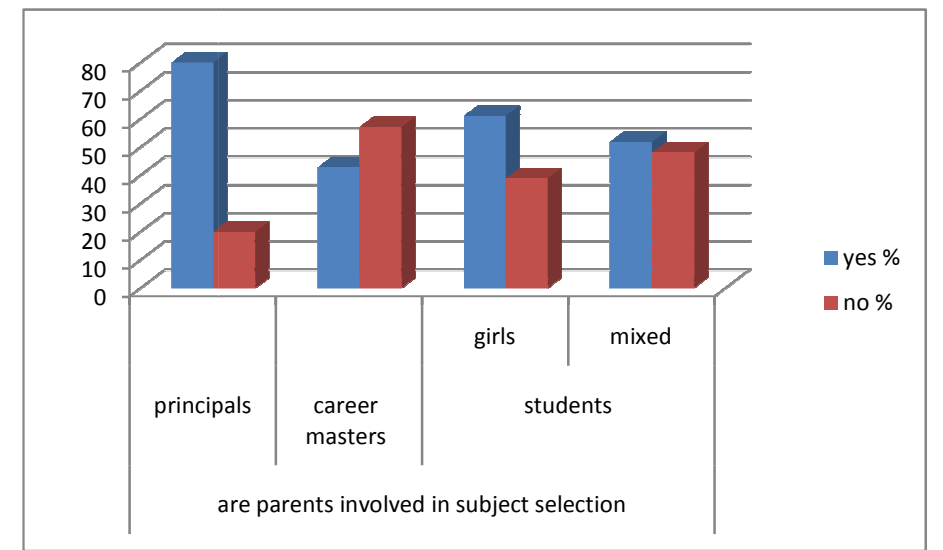
This objective sought to investigate if parents play any significant role in influencing their daughter's decision to enroll in physics subject

4.5.1 Parents involvement in subject selection

The question was poised to the principals, career masters and the students.

The table and the figure below shows their responses on the question above

Figure 4.2 parent involvement in subject selection



From figure 4.2, among the principals 80% said that they involved the parents during subject selection but career masters rarely involve the parents in their programs (57.14% don't). The researcher found that girls in girls only school consulted their parents 61.11% more than in coeducational schools 51.92%. This situation can be explained by what the students said about the level of

education of their parents.

The researcher wanted to assess if the level of the parent's education influences their daughter subject selection. The students were asked to state the level of their parent education. Their responses are summarized in the table below

Table 4.9 Parents level of education

		Girls only		Coeducational schs	
		F	%	F	%
Level of education	Primary	16	10.81	39	25
	Secondary	36	24.32	63	40.38
	Diploma	20	13.51	18	11.54
	Degree	38	25.68	9	5.77
	Don't know	38	25.68	27	17.31
	Total	148	100	156	100

The data from the table 4.9 shows that 58 (39.73%) of parents with diploma and above level of education had their daughters in girls' only schools as compared to only 27 (17.64%) in coeducational schools. Since the findings showed there was a marked difference in enrolment in physics (table 4.5) between students in girls' only school and coeducation schools the level of parents' education thus become a significant factor.

The students were asked to state if their parent's know their subjects'

combination. 89.04% of students in girls' only school said Yes while 86.27% said the same in coeducational schools. The difference margin was noted to be insignificant.

The study also showed that when students were asked to state what encouraged them to enroll in physics subject the parents were rated second with 14.18 %.(table 4.12)

From above analysis it was evident that students in co-educational school are guided slightly by their parents on subjects selection and majority of their parents don't know their subject selection. It can be seen that most parents who take their children in such school have very elementary level of education and hence not knowledgeable enough to give any guidance to their children. Therefore majority of students who go to coeducational schools can't rely on their parents for guidance on career choices. It was clear from the data that such parents were not in a formal employment and hence lacked the necessary exposure to guide their children on the subject selection. It can therefore be said that the higher the level of education of the parent the more involved they become in assisting their children in subject selection.

4.5.2 Employment parents and choice of physics

The researcher wanted to know if the nature of employment of parent affects the extent of the parent involvement in subject selection.

Table 4.10 Type of employment of the parent

Type of employment	Girls Only Schools		Coeducation schools	
	F	%	F	%
Formal employment	76	52.05	10	10.42
Informal employment	70	47.95	129	89.58
Total	146	100	139	100

The table 4.10 shows that parents in formal employment 76 (52.05%) had their daughters in girls only school while 129 (89.58 %) of parents in informal employment had their daughters in coeducational schools. Since the girls' only school in the study had boarding facilities it is taken that the parent in formal employment had the resources to educate in boarding girls only schools.

4.6 Career placement and aspiration in relation to enrolment in physics subject

One of the factors that make human being successful in a particular field is the aspired goals and dreams. The motivation to work for a specific role depends largely on what one wishes to become. It is within such premises that the aspired career plays a vital role in influencing the female students on what to choose.

To answer the above question the researcher sought to establish from the respondents in schools under study whether there had active department of career counseling.

4.6.1 Performance career department

The researcher sought to know from the principals, the career masters and students if the career department is active in the schools. They were asked the above question and the table below shows their responses.

Table 4.11 Existence of career department

	Principals		Career masters		Students			
	F	%	F	%	GIRLS ONLY		MIXED	
Yes	7	70	6	42.85	68	45.33	69	44.23
No	3	30	8	57.15	82	54.67	87	55.77
Total	10	100	14	100	150	100	156	100

It came out clear from the table 4.11 that 7 (70%) of principals' thinks that their schools have a functional career department while more than 50% of both career masters and students think otherwise. This implies that while the principals may have appointed career masters in their schools the departments have remained inactive.

The findings showed that out of 14 career masters who participated in the study none (100%) had a formal training in the field of careers. This can explain why the department of career guidance in many schools has remained inactive. However 192(79.5%) of students agreed that they were well advised by the career masters when selecting the subjects (see table 4.7)

4.6.2 List of 10 alternatives that encouraged or discouraged choice of physics subject

The table below shows how the students identified what encouraged them or discouraged them from selecting physics.

Table 4.12 Factors affecting subject selection (physics)

	Encouraged %		Discouraged	
	F	%	F	%
Fellow students	66	4.70	197	37.03
The physics teacher	227	16.16	24	4.51
Other teachers	111	7.90	52	9.77
The principal	114	8.11	30	5.64
The parent	206	14.66	28	5.26
The career master	151	10.75	7	1.32
The school resources	108	7.69	68	12.78
Past KCSE results	72	5.12	75	14.10
Career aspirations	164	11.67	26	4.89
Personal interest	186	13.24	25	4.70
Total	1405	100	532	100

From the table 4.12 the career master and career aspirations combined had 22.32% as factors that encouraged the female students in selecting physics, a score that is quite high. The physics teacher played the most significant role 16.16% in influencing the number willing to select physics subject. The parent followed closely with 14.66% as the second important factor influencing the girls to choose physics. As stated earlier in the study students at this age are highly influenced by their peers. This is evident in that the fellow students had

37.03% as source of discouragement towards the choice of physics subject.

The students were then asked to state which factor from the list in the table 4.12 made first priority. 49.54% stated career aspirations and 38.53% stated personal interest which is almost the same thing because they define the future prospects. This means that the biggest consideration made by female students in deciding to enroll in physics subject is career placement 88.07%.

When asked to state their preferred careers more than 80% girls stated engineering. The researcher noted that most were stating the traditional engineering courses such as mechanical, electrical, civil, aeronautical, chemical and many others. This agreed with Kagama (2005) finding that in spite of upsurge of careers brought about by informational technology many students when asked of their aspired career will mention the age old lineage of careers. The researcher noted that the situation has remained the same for the eight years difference in the between the two studies. There is a need to equip the students with knowledge on new courses that are constantly emerging as the world advances technologically.

4.7 The practical aspect of physics subject

The researcher sought to investigate the girls' attitude and perceived perception on the practical aspect of physics subject and how it affects their choice of the subject.

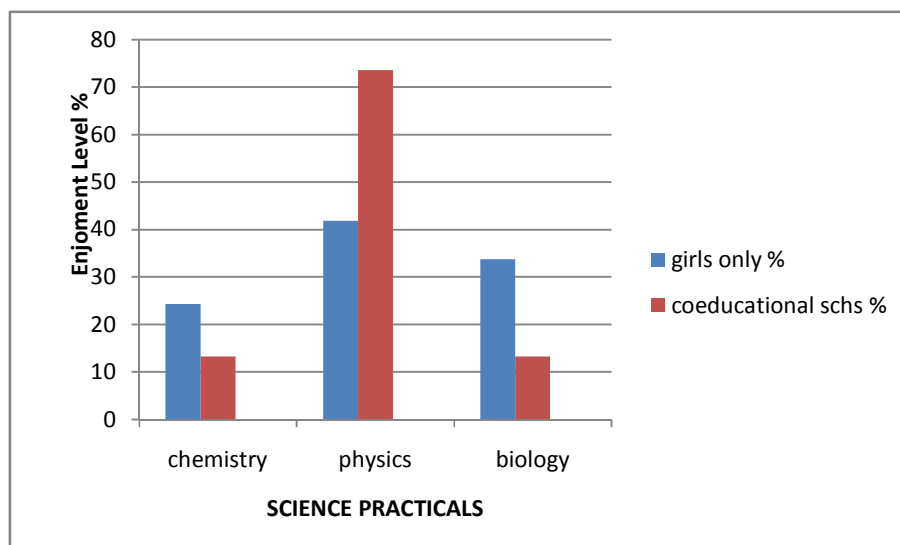
The perception one holds influences their attitude over a certain issue.

Minambo (2013) in his book titled ‘deciding your destiny’ said that the attitude and the perception we have on any event determine energy and the attention we give towards performing the event. (pp. 91). Traditionally majority of female students perceive physics subject as masculine and hence a preserve of the males. This is largely because the physics subject has practical’s that uses more of the psycho-motor skills than the cognitive skills.

4.7.1 Students were asked to state which practical session they enjoy most

The figure below shows how the students responded when they compared the three sciences in form two.

Figure 4.3 The attitude toward science practical



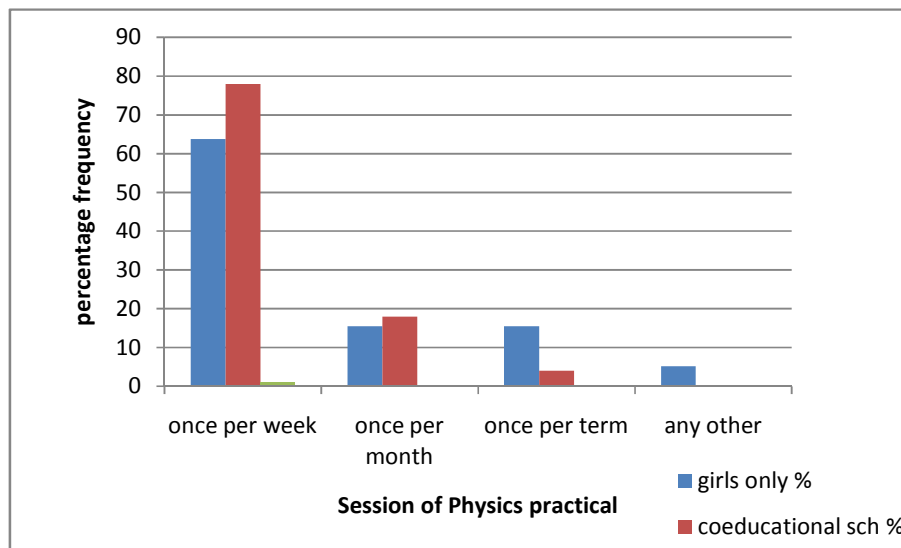
The figure 4.3 shows that in both type of schools physics registered the

highest level of enjoyment at 41.89% and 73.58% respectively. But the margin difference between the two levels was found to be very significant. The researcher observed that the difference could have been caused by the aspect that girls combine with boys in practical session in mixed schools hence developing some confidence in practical work while in girls' only schools such experience is not there.

4.7.2 Students were asked to state how often they do physics practical

The researcher wished to establish the frequency students were exposed to practical work. The figure below shows the responses of the respondents.

Figure 4.4Frequencies of Practical Sessions



It was evident from the figure 4.4 that girls in coeducational schools have a higher rate of doing physics practical 78% than girls only schools 63.79%. The high frequency of doing practical in co-education school can also explain why

girls in such school enjoyed the practicals more than those in girls' only schools. 5.17% of girls in girls only schools couldn't remember when they did physics practical last while there was no such response in co-educational schools.

The researcher wanted to find out how the students view the methodology used in teaching physics. The students should have confidence that they can handle the theoretical and practical aspect of physics subject. Therefore the teaching methodology employed that integrate the two aspects become vital in influencing the number enrolled in the subject. They were asked the following question and given four alternatives to answer from

4.7.3 Teaching methods or approaches applied by physics teachers.

The table below shows the students responses when divided into two categories of girls only school and co-education schools.

Table 4.13 Students' responses about teaching of physics methodology

	Girls only %		Coeducational sch %	
	F	%	F	%
Entertaining and interesting	20	13.7	15	9.43
Easy to understand content	70	47.95	102	64.15
Encouraging and informative	34	23.28	42	26.42
None of the above	22	15.07	0	0
TOTAL	146	100	159	100

Table 4.13 shows that girls from coeducational school had the highest

percentage 102 (64.15%) that they find teaching methodology used by physics teachers easy to understand the content. The same category had the highest rate of doing practical per week indicating that when the teaching method becomes student centered the learning of concepts become easy to understand. It was interesting to observe that 22 (15.07%) girls in girls' only school couldn't agree with any of the three given alternative while there were none in co-education schools. This implies that their views were not captured and were

4.7.4 Laboratory facilities and equipment

The table below shows the findings from the check list that investigated availability of laboratory facilities and equipment

Table 4.14 Level of adequacy of facilities and equipments

Area	LEVEL	F	%
Facilities	Adequate	14	87.5
	Inadequate	2	12.5
Equipments and Apparatus	Adequate	13	81.25
	Inadequate	3	18.75

From table 4.14 most schools had enough facilities and equipments at 87.5% and 81.25% respectively. The facilities under investigation included the laboratory structures, practical preparation rooms, furniture, power and water supply. The researcher wanted to find out if all equipments and apparatus necessary to conduct physics practical were available and adequate.

CHAPTER FIVE

SUMMARY OF FINDINGS, DISCUSSION AND CONCLUSIONS

5.1 Introduction

In this chapter a discussion of the major findings of the study is presented. The chapter is divided into four sections: Section one presents a summary of the findings of the study; Section two presents a discussion of the findings while section three carries the conclusions of the study. Finally in section four the researcher makes recommendations as well as suggestions for further areas of research.

5.2 Summary of the Study

This study was carried out to investigate the factors influencing survival rate of female students enrolment in physics subject at form three in Kirinyaga Central District. The study had four objectives. How do the school policies influence the enrolment in physics subject at form three by the female students' in Kirinyaga Central District? What role(s) do parents play in influencing their daughters towards the choice of physics subject at form three? How does the future career placement affect the female students in enrolling in physics subject at form three in public secondary school? How does the practical aspect of physics subject affect the female students in

enrolling in physics subject at form three in public secondary school in Kirinyaga Central District?

The research instruments used were Questionnaires for students, teachers and career masters, interview guide for principals and observation schedule for laboratory technicians. The sample of this study was selected using stratified and simple random sampling

The respondents consisted of 10 principals, 14 career masters, 16 physics teachers and 308 students selected from 16 schools.

The test-retest technique was used to check the reliability of the research instruments which obtained coefficient of correlation as on the table 3.2 (p)

The data collected was coded cleaned and analyzed by use of descriptive statistics. The researcher used SPSS version 16 to summarize the quantitative data into frequencies and percentages that were used to answer some of the research questions.

5.3 Summary of the Findings/Discussions

The summary provides a brief outline of the outcomes of the investigated objectives of the study. The findings of the five objectives that guided this study are discussed below.

5.3.1 School policies and their effect on girls' enrolment in physics

All the principals agreed that level of girls' enrolment in physics is indeed lower compared to the other sciences. More than half of students disagreed that the principal played an active role during subject selection. Further the disparity that showed most of principals believes they have functional career department while the career masters and students believe otherwise showed lack of touch of principals and what goes round in various departments in their schools.

Though most students agreed that subject selection exercise was free and fair the schools had already established rules which the students were to fit in. This meant that the student could only choose from what is being offered. This study shows that more than half of students said that there was no limit set for those wishing to register in physics and 74% said previous performance in mathematics was not a factor.

5.3.2 Parental influence on girls' enrolment in physics

The finding of this study has shown that parents are the second important factor that affects the female choice of physics of all the factors considered.

The country policy makers should endeavor to improve the literacy levels

because this study has shown that the more the parent are educated the bigger the role they play in influencing their children in careers of their abilities.

5.3.3 Career placement and aspiration

This study found that the career aspiration rated fourth from other listed factors in encouraging female students enroll in physics subject. These findings are hoped to awaken the career departments in most schools become relevant and current in information as they are inactive.

5.3.4 Practical aspect of physics subject

The findings of the study have also shown that the schools have well established laboratories and hence the performances of sciences cannot be affected by lack of necessary equipments and chemicals. The schools under study were found to have adequate laboratories capable of accommodating all physics students. The laboratories were also found to be sufficiently equipped to enable 90% of physics practical. All the schools visited had one or two laboratory technician. The biggest beneficiary of this study is the female students because the study has highlighted several factors that hinder high enrollment in physics subject and once they are mitigated the imbalance in gender will reduce.

5.4 Conclusion

Based on the research findings the researcher concludes that:

- Schools policies and guidelines on subject selection played the most significant factor in preparing students on how to make their choices. The policies form the framework at which the subject teachers follow in educating the students on the subject choices.
- Parents are second in influencing their daughters' science selection at form three. The more the parent is educated the higher the degree of involvement.
- In most schools the departments of career guidance is not active. This is caused by the fact that virtually all career masters are not formally trained in this area.
- The practical aspect of physics subject mostly in girls' only school has contributed negatively towards the perception of the subject. It was found that in such schools the practical are not emphasized and hence the learners lacks the hands on activities that can simplify the content. Most schools have well equipped laboratories that can support physics practical with qualified laboratory technicians.

5.5 Recommendations

From the study the following ways were suggested to increase the number of female students enrolling in physics subject.

- Strengthening career guidance in schools. Information on careers should be provided to students and parents at the earliest opportunity and be done on a continuous basis. The schools should create forums and meetings where parents are educated on the careers in order to advice their daughters wisely when it comes to subject choice. The career and physics teachers should be well versed with the career opportunities in physics so that they can bring current information on careers to their students.
- Simplifying the concepts in teaching methodology and involving students in discussions and practicals. Embracing e-learning to show animations and make abstract concepts look real
- The Ministry of Education through the Teachers Service Commission can use the generated information to explore ways of appointing well trained career counselors in the schools. This would enable students to make informed choice of subjects and hence study in their subject

areas with confidence and purpose.

5.6 Suggestion for Further Research

- A similar study should be carried out on a different sample in order to authentic the findings of this study.
- A study should be carried out to investigate other factors that were not included in this study like the entry behavior of students and how they affect the girls' enrollment in physics subject.
- A study should be carried out to investigate causes of the major difference in physics enrolment between girls' only schools and coeducation schools.

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APPENDICES

APPENDIX A

INTERVIEW SCHEDULE OR / QUESTIONNAIRE FOR PRINCIPALS

SECTION A: Demographic Information

1. Gender **M/F**
2. Type of school **Girls only/ co-education**
3. Experience in headship position
4. Subject trained to teach
5. Highest academic qualification

SECTION B: Subject Selection and School Policy

6. Are students in your school well guided in subject selection? **Y/N**
7. Are the parents involved when your students are making their subject selection? **Y/N**
8. According to you what factors affect the perception/attitude of girls in your school towards physics subject choice
9. At what stage do students select subjects in your school?
10. Are students in your school given a chance to revise their choices after selection? **Y/N** If yes, after how long
11. Are there rules in your school directing the subject selection options? **Y/N** If yes please specify.
12. Does your school have qualified personnel to guide career choice? **Y/N**
13. Does your school have enough facilities and equipments to cater for all those wishing to select physics subject? **Y/N**
14. Does your school have enough qualified physics teachers and laboratory assistants to handle all physics students effectively? **Y/N**
15. What should be done to encourage more girls select physics subject at form three?

Thank

APPENDIX B

QUESTIONNAIRE FOR PHYSICS TEACHERS

Dear Sir/Madam.

I'm a student at UON pursuing post graduate studies. I'm carrying out a study on **female students' participation in making decision of selecting physics subject at form three in Kirinyaga Central District**. I kindly request you to fill in this questionnaire as a subject teacher to assist me get the desired data. The information you will give will be highly appreciated, treated confidentially and only used for the purpose of this study.

SECTION A: Demographic Information

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

1. Please indicate your gender

a) Male () b) Female ()

2. What is your age bracket?

a) 30 and below () b) 30-40 () c) 40-50 ()
d) Above 50 ()

3. What is the type of your school?

a) Girls only()

b) Co-educational (Mixed school)()

4. What is your highest professional qualification?

Diploma() Higher Diploma() Degree() Master Degree ()

5. What is your teaching experience?

a) Less than 5 years ()

b) 5-10 years ()

c) 10-15 years ()

d) Beyond 15 years ()

SECTION B: Attitudes towards Girls Future in Physics Oriented Careers

7. Please indicate whether you: **Strongly Agree (SA),**
AGREE (A), **Undecided (U), Disagree (D),**
Strongly Disagree (SD)

Please tick(✓) in the spaces provided as appropriate

STATEMENT					
Physics oriented careers are equally suitable for both men and women					
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					
A student should enroll in the three sciences in order to broaden his/her courses and career choices					
Girls need more support patience and encouragement from teachers than boys in order to excel in physics					
In ensuring gender equality and equity in higher education and employment more girls should enroll in physics					
Any interested student in physics should be allowed to enroll regardless of marks scored in form one and two					
In order to demystify that physics is masculine subject the government should employ more female physics teachers					

SECTION C: Science Subject Selection

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

8. How many girls have chosen physics in F3 this year total number of girls in

F3

9. When students are choosing the science subjects what consideration takes the first priority in your school?

a) Future career prospects ()

b) Previous student's performance in physics ()

c) The number to enroll ()

d) Student's interest ()

e) Specify any
other

10. When do you think its appropriate time for students' to do subjects selection?

.....

11. Are Students given enough time to consult their parents or guardians regarding their subject choices and Future Careers?

Yes () No
()

12. Which type of content do you think girls have major problem in?

List in order from the most to the least difficult.

(i) Concrete (ii) Abstract (iii) Mathematical

13. What is your opinion about the facilities for teaching physics in your school?

a) Adequate for all students ()

b) Adequate only for those students taking physics ()

c) Inadequate ()

d) Any other please
specify

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

15. As a subject teacher, what would you say of your knowledge and skills in guiding students in career choices relevant with the concepts learnt in the subject?

- a) Excellent ()
- b) Competent ()
- c) Fairly competent ()
- d) Below average ()

Thank you for your cooperation

APPENDIX C

QUESTIONNAIRE FOR CAREER MASTERS

Dear Sir/Madam.

I'm a student at UON pursuing post graduate studies. I'm carrying out a study on **female students' participation in making decision of selecting physics subject at form three in Kirinyaga Central District**. I kindly request you to fill in this questionnaire as a subject teacher to assist me get the desired data. The information you will give will be highly appreciated, treated confidentially and only used for the purpose of this study.

SECTION A: Demographic Information

Please answer appropriately by ticking or crossing (✓ or /) one of the provided alternative or write as applicable where explanations are needed.

1. Please indicate your gender _____
2. What is the type of your school?
 - a) Girls only ()
 - b) co-educational (Mixed school) ()
3. Are you formally trained in career guidance? Yes/No if yes what is your highest qualification _____
4. What is your experience in career guidance?

5. What are your other teaching subject combinations

SECTION B: Subject Selection

6. Is there a formal career guidance programme in school? Yes/No.
how often per term?

7. Does the school invite external career speakers? Yes/No. how often per term?

8. Are students in your school aware of the career possibilities before subject selection is done? Certainly aware () Not aware () Not sure ()

9. What consideration is given the first priority when students are choosing the science subject in your school?

10. When do you think its appropriate time for students to do subject selection?

When is the selection done in your school?

11. Who are the major players that influence the girls' physics selection?

a) Career interest ()

b) subject teacher ()

c) the parents ()

d) peer group ()

e) Others (please specify) _____

12. Does your department have ways of involving teachers and parents in career guidance programmes.

13. Does your department have enough resources and materials to facilitate effective career guidance?

14. What are the major challenges that inhibit effective career guidance programmes in your school?

a) _____

b) _____

16. In your own opinion what should be done to encourage more girls select physics subject at form three?

a) _____

b) _____

Thank you for your cooperation

APPENDIX D

QUESTIONNAIRE FOR STUDENTS

Dear student.

This research is being carried out on **Female Students' Decision Making in Choice of Physics Subject in Secondary Schools in Kirinyaga**. The researcher is a post graduate student university of Nairobi.

You are kindly requested to fill the following questionnaire for the purpose of this study. The information given will be highly appreciated and treated with outmost confidence.

Section A: Demographic Data

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

1. Please indicate your gender.

- a) Male () b)
Female ()

2. What is your age bracket?

- a) 14 and below ()
b) 15-17 ()
c) 18-20 ()
d) Above 20 ()

3. What is the type of your school?

- a) Girls only ()
b) Co-educational (Mixed school) ()

4. What is your science subject combination

SECTION B: Students Perceptions and Experiences of Subject Selection

The statements in this part describe the physics subject selection as done in

your school.

Please use a tick(✓) to indicate your response in the space provided to the extent in which you agree or disagree with the statements provided below.

5. You are given five alternatives depending on the extent of agreement. The alternatives are;

Strongly Agree (SA), AGREES (A), Undecided (U), Disagree (D), Strongly Disagree (SD)

STATEMENT	SA	A	U	D	SD
There was a limit of number of students to be in physics class					
The subject selection exercise was free and fair					
Students were given another chance to change their selection					
students were well guided on how to make choice of our interest					
there was freedom to take the three sciences subjects					
Physics students were selected depending on interest and marks scored in mathematics					
some students were advised against selecting physics by the teachers					
our career master offered a lot of advice on how to choose science subjects					
Our head-teacher offered a lot of advice on how to choose science					

6. On average what has been your score in physics at form two?

- a) B+ plus and above ()
- b) Between c+ and B plain ()
- c) Between D+ and C plain ()
- d) D plain and below ()

SECTION D: Students Aspired Career and Subjects Choices

Instructions: Please read and answer the questions by putting a tick (✓) within the brackets to the question given. Some questions require answer to be written down in the space provided

7. Do you know the career master in your school? Y/N

8. Do have **career** guidance and counseling sessions in your school?

Yes ()

No()

9. Among the following factors categorize them on the basis of which encouraged or discouraged you when making your choice.

Fellow students, your physics teacher, other teachers, your principal, your parent, career master, Level of learning materials such as textbooks laboratory equipments etc, performance of physics in KCSE in your school in previous years, career aspirations, personal interest.

ENCOURAGED	DISCOURAGED

10. When choosing your science subject combination which factor from the list above

(Question 9) made the first priority

11. Which career would you like to take after your education?

.....

SECTION E: Parental influence

12. Is your parent in formal employment (salaried)? Yes ()
No ()

13. What is your parent highest level of education? Please tick where appropriate.

Non formal education		Diploma	
Primary		Degree and above	
Secondary		Don't know	

14. Do your parents know your science subjects combination? Yes()No
()

15. Did your parent play any role in influencing your choice? Yes()
No()

Section F: The practical nature of the Subject

16. Which practical laboratory work sessions did you enjoy most in forms 1 and 2?

Chemistry ()Physics ()Biology ()

Please _____ give
reason
...

17. How often do you do physics practical

- a)Once per week ()
- b) once per month ()
- c) Once per term ()
- d) Any other (please specify)

18.. How did you rate the teaching methods or approaches used by your physics teacher in form one and two?

- a) Entertaining and interesting ()

- b) Easy to understand content ()
- c) Encouraging and informative ()
- d) Non of the above ()

SECTION F: SCHOOL POLICY

19. Was there a directive or rule from the school on how the science subjects were to be chosen? Yes () No ()

If yes what was the directive

20. Was physics grouped with non-science subject? Yes () No ()

If yes which was the non science subject

21. In your own opinion what should be done in your school to encourage more girls select physics at form three?
.....

Thank you for your cooperation

APPENDIX E

CHECK LIST FOR LABORATORY FACILITIES AND EQUIPMENT

Area	Item	Number	
Facility	No of laboratory technician/assistants		
	No of laboratories in a school		
	No of students that can adequately fit in the laboratory during an experiment		
Equipments and Apparatus	Item	Available	Not Available
	Preparation room		
	Piped water		
	Gas taps		
	Mains electricity kit		
	Mechanics set		
	Other sources of power		
	Electronic balance		
	Other types of balances		
	Ripple tank		
	CRO		
	GM Tube		