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Determinants of Girls Low Enrollment in Physics in Secondary Schools: Case of Kajiado North District, Kajiado County, Kenya.

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Abstract
Women and girls in Kenya constitute more than 50% of the country's population (KNBS, 2012). Their full participation in science and technology at the leadership levels is crucial for realization of Kenya Development Vision 2030. In view of this, girls low enrollment in physics nationally and in particular Kajiado county, is of great concern since many of them will be technically not eligible for many university and polytechnic science courses where physics is a requirement. The purpose of this study was to find out the determinants of girls low enrollment in physics in Kajiado North district. The study also examined implications of girls' absence in Science, Technology, Engineering and Mathematics (STEM) to achievement of gender equality and equity in education and employment by 2015 being one of Millennium Development Goals (MDGs). The researcher sampled 12 public and private secondary schools which constitute 30% of all secondary schools in the district. Eight schools and four girls' only schools took part in the study. The target population was the head-teachers, physics' teachers, form three girls and career guidance counselors. The sample attracted twelve head-teachers, twelve physics teachers, twelve career counselors and two hundred and forty students. Purposive sampling was used to get head-teachers and physics teachers. Students were put into two strata (those who enrolled in physics and those who did not). From each group, ten students were picked using simple random technique. Data was collected by use of questionnaires, physical facilities checklist and lesson observation guide. Both descriptive and influential statistics were used to analyze the data, using the Statistical Package for Social Sciences (SPSS version 11.5). The study revealed that girls attitude towards physics is just positive. However, most schools lack a particular trained career master. Gender stereotype and peer pressure influenced many girls in science subjects selection. Physics' teachers' lack of support and concern to girls during practical lessons discouraged many girls to proceed with physics beyond form two. The study recommends that each school should have a fully pledged career department, managed by a trained career masters. Head-teachers need to take charge and demonstrate prudent leadership by supervising subjects' selection exercise as part of curriculum implementation.
Key Words: Girls Low Enrollment In Physics In Secondary Schools, Kajiado County, Kenya

1.0 Background Information

The concern for the poor participation of girls in science and technology was noted in as far back as 1976 when the National Commission on Education Objectives and Policies reported that, in Kenya the majority of educated women tended to go into nursing, secretarial, and teaching careers. This committee recommended that this restrictive trend needed to be evaluated and the desirability of encouraging women to go into other careers be determined (Gachathi Report, 1976).

The Koech commission report of 1999, noted that science is a vital requirement for industrialization, adding that a sound technological education and training demands a good science background be provided (Koech, 1999). The Koech report further observed that since over 50% of Kenyans are women, their inclusion in efforts towards industrialization is vital. The commission thus recommended that girl's participation in science be encouraged. Science and technology also helps developing countries to exploit fully existing techniques as well as to improve upon those that are not perfectly suited for the prevailing conditions (Chege & Sifuna, 2006). Globally, women tend to be under-represented in science and technology. This is partly due to choices they make at lower levels in their school education (Baguma and Muhairwe, 1999). Mwayuli (2008) in a paper presented at the 14th International Conference of Women Engineers and Scientists in France, suggested that Kenya women scientists and engineers through well coordinated networks should come out strongly to change societal attitudes, influence policy, mentor and empower young girls to get into science and engineering.

Science and mathematics are the key subjects that are needed for one to advance in the field of technology and industrialization. Attempts to increase opportunities for women and girls in Science, Technology, Engineering and Mathematics (STEM) subjects at secondary and university levels have taken a priority in policy discussions in Kenya. However, the commitment to translate this priority into action has remained problematic for many schools as they lack the required human and material resources. In addition, even where such resources are available for the girls, career information and counseling has remained wanting, thus continuing to mystify the STEMs, excluding and condemning most girls to a future that lacks adequate scientific and technological knowledge and skills. This is critical for development, not only of girls but also of the nation (UNESCO, 2009).

Table 1.1 shows enrolment of science subjects in KCSE for 2010-2012 in Kajiado North District.

Table 1.1: Enrolment of Science Subjects by Gender in Kajiado North District, 2010-2012.

Year	Physics Candidature		Biology Candidature		Chemistry Candidature	
	Girls	Boys	Girls	Boys	Girls	Boys
2010	254	945	878	500	1231	1329
2011	274	958	906	893	1250	1487
2012	280	921	1050	945	1380	1523

Source: Kajiado North District Education Office 2012 KNE Analysis

It is quite evident from table 1.1 that an alarming small number of girls enroll in physics each year. Both girls and boys enroll in biology and chemistry in large numbers. However without physics their possible chances of pursuing STEM courses in higher education are greatly narrowed.

According to Ministry of Education Science and Technology (MOEST) (2005), women's low participation in technical fields is exacerbated by the admission requirements, which place a strong premium on achievements in specific science subjects and mathematics.

1.1 Statement of the Problem

The Kenya development vision 2030, envisions an industrialized middle income economy driven by highly trained and motivated workforce (Ministry of Planning and National Development, 2012). To realize the envisaged goals, appropriate modern technology must be applied in almost all sectors of economy. It is then obvious that the technologists expected to charter the way through the seemingly indelible task is the current boys and girls in our secondary schools**.**

It is therefore puzzling that when the country is geared for rapid technological growth, secondary school girl's enrolment in physics remains alarmingly very low in Kajiado North District. If the issue of gender career stereotyping and biased choice of science subjects is not addressed objectively and with seriousness it deserves, opportunities that would otherwise been available for female students to advance academically will become foreclosed. This in the end will make it difficult for Kenya to achieve the MDG goal of gender equity and equality not only in education but also in employment by 2015, hence the need for this study.

1.2 Objectives of the Study

The study was anchored on the following objectives:-

a) To determine girls attitude towards physics

b) To find out the status of career guidance and counseling services in secondary schools and its influence on girls' choice of physics

c) To examine the role played by the school administration in students during subjects' selection

d) To determine teacher related factors influencing girls' choice of physics

2.0 LITERATURE REVIEW

2.1 Women and Technology Development

Women in Africa constitute more than 50 % of the continents' population (UNESCO, 2010). Thus, their full participation in science and technology at the leadership and research levels is crucial for the rapid industrialization of the continent. This goal can only be achieved if girls embrace and excel in subjects, which will eventually enable them engage in science and technology. The First African Union Conference of African Women in Science and Technology was convened by the African Union Commission (AUC) in Johannesburg, Republic of South Africa in August 2007. The meeting noted that in Africa, 50% of the population are women and are seriously underrepresented in science, mathematics and engineering fields and yet they are a resource that could contribute towards the social and economic development of the continent through participating in science and technology programmes (AUC, 2007).

Apart from mathematics that is compulsory to all secondary school students in Kenya, physics knowledge is proving to be of invaluable applications in the wake of modern gadgets such as computers, electric heaters, juicers, hairdressers and hot water systems in bathrooms to sexual gratification gadgets. Many people have been reported killed in kitchen and bathrooms due to electrocutions. Thus, it is imperative that all people, if possible should be equipped with the physics knowledge. According to UNESCO (2009), many women fail to participate in science and technology, fail to take sciences courses such as engineering due to inadequate knowledge and confidence in mathematics and physics among other reasons.

2.2 Career Guidance and Counseling

Guidance and counseling programme is one of the most important components of the school curricular activities. According to Handbook for Schools Guidance Counsellors (MOE, 2007), guidance is a process through which the individual is helped to develop his mental abilities, aptitudes, interests and personal dynamics. Counselling

on the other hand is a process of the relationship between a counselor and a client or counselee with a view of helping the counselee to understand his or her problems in relation to his or her thoughts, feelings and behaviour in order to make informed choices of action.

The Koech Report (1999) noted that Kenyan institutions of learning have failed to inculcate positive attitude towards work, and recommended a redesigning of the institutions approach with a view of improving this situation compounding to the overall problem of unemployment, laxity and poor performance in both public and private sectors in the country. Lack of professionalism and non-adherence to professional ethics are widespread in the Kenyan workforce. A scrutiny into this situation gives indication that there may be an underlying fundamental problem of lack of proper vocational or career guidance and counseling. Makinde (1984), points out that guidance and counseling in Africa will bear fruits only if it focuses on educational, vocational and career planning skills, among other things.

In order for career guidance and counseling to make a significant contribution, it must impart a significant high level of career awareness, which will lead to appropriate career planning and decision making. Luzzo, James and Luna (1996), found that students who received an attributional retraining treatment exhibited significant changes in their career beliefs and career exploration behaviours. Hence, career guidance and counseling leads to a deeper and wider understanding of ones personality and world of careers.

In today's world, youth are at crossroads educationally, socially, economically, and in relation to work. There are many challenges facing them in the society and this complexity requires proper guidance (Mutie & Ndambuki, 1999). These prevailing challenges are educational, cultural, economic and personal in nature. In addition, globalization and the continued rising of competitiveness are major challenges for the youth today. As such, provision of guidance in educational institutions is a vital tool that students can use to sort out and order their views and decisions about their intended careers.

In her study on the effect of guidance and counseling on students' academic achievement, Mmbone (2008), found that just as much as counseling has positive effects on the area of academic performance, it was also found to help the learners in choosing their careers, improves students' discipline and curbs students' unrest in schools. An effective career counselor should read widely to keep abreast with the constantly changing career, labour and employment sub sector. For instance a career counselor should be able to comprehensively explain how the various cluster subjects will determine the courses students can take at university level.

2.3 Girls Participation in Science

Some people (including some feminists) argue that science, as taught today, is a dehumanizing activity and that girls' benefit from choosing arts subjects, which allow for greater personal growth (Potter, 2006). Others suggest that society needs diversity, with a clear distinction between male and female, and that effort to reduce sex differentials are misguided (Scott, 1991).

However, all these views are subject to discussion. Many people do agree that the case for encouraging girls into physical science especially physics need to be argued. According to Baguma and Muhairwe (1999), this can be done in several distinct ways. The first is to stress the restrictions, which sex stereotypes place on an individual. If children's choice are limited by what they themselves consider to be suitable for girls or boys, what their teachers, parents, peers or employers consider to be suitable, then they are not able to develop their potential in the full. Stereotyping reduces liberty and consequently growth and development. Both the individuals concerned and the society as a whole loose from the restrictions of talent. Relevance is reported in terms of usefulness either to daily life or to students' goals. The evidence from surveys indicates that both boys and girls (but more girls than boys), across the ages of secondary schooling, consider that the physical sciences are not personally relevant, in contrast with their views of biology. According to (Lyons, 2004), there is some evidence, that a minority of students, predominantly boys, are content with the abstract nature of physics and study it for its extrinsic value in securing a career or gaining them more knowledge about the world.

Personal frameworks of relevance inform what we pay attention to and the connections that we make between new meaning and established meanings, and research evidence shows that there is an important gender dimension to this. If physics is presented in the context of abstract school activities, then many students have to make their own bridges to relevance in order to create personal meaning in school tasks. Failure to be able to make these bridges is more problematic for girls than for boys (Krogh & Thomsen, 2005).

According to Murphy and Whitelegg (2006), early interventions in the science curriculum to increase girls' access can be understood as attempts to address the outcomes of differential views of relevance. Girls were seen to have "missed opportunities" to learn and develop skills and knowledge relevant to science because, typically, compared with boys they engaged in different activities outside school and avoided activities in school that they were unfamiliar with. The current study aimed at investigating whether girls are able to make the necessary bridges in their abstract thinking by observing the way they conducted physics practical in the laboratory. To achieve this, the researcher used laboratory lesson observation guide.

2.4 Girls Career Aspirations and Gender Career Stereotyping.

Aspiration is a goal that an individual sets for himself in a task that has intense personal significance for him. It refers to a person's orientation towards a goal (Stokking, 2000). During adolescence, individuals begin to plan for their future career by considering a number of occupational choices. Counselors, parents, and educators may be better able to assist adolescents in their exploration of occupational options, help them seek career-related information, and obtain support for their career plans by developing a greater understanding of adolescents' occupational aspirations. Tinklin, et al& (2005), observed that in spite of their increasing numbers, women have tended to enter the workforce in lower-status, lower-paying jobs, and remain clustered in a limited number of conventional careers. Low-paying traditionally female careers, including administrative support, sales, service, nursing, teaching, social work, and clerical jobs, reflected society's persistent attitudes regarding stereotypical occupational roles for males and females.

The information that young people receive about possible careers will influence their decision-making. However, there is some evidence that the information young people receive is not necessarily up to-date or realistic. A study by Francis (2002) of 14-16 year olds in London found both boys and girls had little knowledge about the adult workplace and the qualifications required for particular careers. She found careers guidance was often provided by teachers who did not have accurate knowledge of the employment market or information about particular careers. The major labour market changes of the past 20 years do not appear to have filtered down to young people.

Semple, Howieson, & Paris (2002), also found that the accuracy of the information provided informal networks was sometimes questionable in a rapidly changing labour market. The informal network, usually parents, also had an impact on young people's choices in other ways. This is an important source of encouragement and motivation to young people and can sometimes raise expectations to make the most of opportunities. This network can also provide practical assistance in terms of information, help with forms, and contacts in the occupation being considered by the young person. These informal interventions were on the whole fairly positive for young people, but not all individuals had the same level of access to support and information provided may not always be accurate.

2.5 Students' Interest, Motivation and Attitude towards Physics

Murphy and Whitelegg (2006), contends that the key determinants of students' attitudes to physics are: how students see themselves in relation to the subject, both now and in the future: their "physics self-concept"; their experience of school physics and a personally supportive physics teacher. Students, even if they are interested in the subject, need to feel that they can do physics and this may be more significant for girls than for boys. Studies have found that for some girls, as they continued with their study of physics, their self-concept in relation to it declined (Reid & Skryabina, 2002).

Musyoka (2000) found that the majority of the students who were not taking physics were scared by its quantitative nature and its being too abstract especially when it is taught theoretically. He recommended a change in the approach to teaching of physics and proper curriculum guidance in schools. He further noted that to maintain girls' and boys' interest and motivation to study physics 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. Students need to feel that they can do physics if they are to decide to continue to study it, and this is particularly true for girls.

2.6 Teachers' Role in Encouraging Girls to do Physics

Teachers have a special role in controlling all the instruction and learning environment in the classroom. Teachers' attitude and behaviour in relation to science and technology are important influences on the attitude of girls. In recognition of the role of teacher in effective teaching, Kelly (1987), warned, "Teachers should not assume that methods which are successful with boys will be automatically be successful with girls but should be sensitive to sex differences in interpersonal relationship (p.87)". Murphy and Whitelegg (2006) in a study to identify the strategies that have succeeded in increasing the number of girls studying physics post 16 years in United Kingdom, noted that all students require support from teachers but, in physics, where some girls have a less positive self concept, it is much more important for them to receive support. Further, they found that boys tend to find male teachers more helpful and understanding than girls find teachers of either sex.

Teachers' behaviours and attitudes are a key influence on student attitude, motivation, achievement and continuing participation (Labudde, 2000). Lee (2002) in a US study of 340 students in summer science, mathematics and engineering programmes, found that the quality of relationships to significant others was an important influence on female students' choice of subjects. This is in line with Krogh and Thomsen's (2005) findings that personal teacher support was a key predictor of attitudes to physics. If teachers are detached or uncaring and friends do not discuss science this will particularly affect girls' choices as they move to college.

Most of studies done in Kenya on teacher related effects towards students' attitude, achievement, motivation and participation in physics, are in agreement with the other studies already considered. Kinaiya (2008)

recommended that teachers should teach physics using different strategies like field trips, projects, demonstrations, model constructions, class experiments and group experts to develop curiosity in the learners. Munguti (2004) found that the physics teachers' characteristics such as speed of talking, comments made to students in class and style of teaching sometimes put girls off such that some eventually drop the subject. Wambua (2007) recommended that physics teachers need to also know the attitudes of their students toward the subject especially in form one and two. In addition, they should strive to create a positive attitude in the students towards the subject.

2.7 School Administration Influence in Science Subjects Choices

The school head teacher, deputy head teacher, head of academic department and the career counselor are expected to play a major role during the subjects selection exercise. The head teacher is in charge of all that goes on in the school ranging from human resource management, financial management to curriculum implementation (Mbiti, 2007). He or she interprets the policy on behalf of the ministry of Education, executes curriculum programmes, ensures provision of equipment, physical facilities and maintains effective school community relations.

The quality of administration determines the level of success in the implementation of the curriculum. Through delegation of duties the head teacher empowers various departments to effectively accomplish the school goals and objectives. In many schools the academic department is mandated to conduct the form three students' subjects' selection exercise after ensuring that the curriculum requirements have been understood by all students. However a number of past research studies revealed that this is one of the areas that students are not fully involved but rather hurriedly coerced into subjects choices that may not enable them to join the aspired careers. For example Musyoka (2000), found that some students who had dropped physics, expected to pursue courses such as geology, meteorology, biomedical engineering, dental surgery, survey engineering and many others which required a good physics grade in KSCE.

A study by Muli (2005) on the effects of head-teachers' management styles on performance in physics in Kitui district, found that performance in physics, indirectly depends on the management styles of the head teachers and is highly affected by their management characteristics such as acquisition of text books, equipments, qualified teachers, proper guidance and counseling to change the attitude towards the subject and poor motivation of teachers.

2.8 Summary

The reviewed literature highlighted the global recognition of the immense potential input in social and economic development by women through science and technology. Gender equity has been of great concern since 1990s, after it was realized that for meaningful rapid development in all sectors to be achieved, all people in the country must be actively involved. The literature has fore grounded that although deliberate efforts to reduce the underrepresentation of women and girls in STEM has been made, a notable disparity still persists and more so in developing countries.

The researcher identified several knowledge gaps that needed to be filled through investigation. There was little evidence on studies done targeting the effect of school administrators' leadership on girls' enrolment in physics. Studies done on effectiveness of career guidance and counseling in schools were general in nature and did not particularly tackle the career guidance effect on girls' enrolment in physics and other science subjects.

Studies on physics teachers' effect on girls' enrolment mainly collected data through questionnaires and none used both classroom and laboratory observation guide. As a result they lacked the full benefit of triangulation. Though a physics teacher might be very effective and very supportive to students in classroom, his or her level of support and effectiveness might be very different during a practical lesson. A research study to investigate these factors was therefore needed.

3.0 RESEARCH METHODOLOGY

The study employed a cross-sectional descriptive survey design. According to Fraenkel and Wallen (2000) and McMillan (1991), cross-sectional descriptive survey collects information from a sample that has been drawn from a predetermined population at one time. This reduces threats to internal validity of the study that may arise from factors such as history. The research design is chosen because the researcher only intends to gather data on existing state of affairs in target population without manipulating any variables (Kombo &Tromp, 2006). Gall, Borg & Gall (1996), noted that descriptive survey research is intended to produce statistical information about aspects of education that interest policy makers and other stake holders. The target population was the head teachers, physics' teachers, form three girls and career guidance counselors. The sample attracted twelve head teachers, twelve physics teachers, twelve career counselors and two hundred and forty students. Purposive sampling was used to get head teachers and physics teachers. Students were put into two strata (those who enrolled in physics and those who did not). From each group, ten students were picked using simple random technique. Data was collected by use of questionnaires, physical facilities checklist and lesson observation guide.

Both descriptive and influential statistics were used to analyze the data, using the Statistical Package for Social Sciences (SPSS version 11.5).

4.0 RESEARCH FINDINGS AND DISCUSSION

4.1 Introduction

The purpose of this study was to establish the determinants of girls' low enrollment in physics and their implications to gender equity in Kajiado North district, Kajiado County. To achieve this objective, salient areas were examined in relation to impediments leading to girls' low enrollment in physics namely: girls attitude towards physics, status of career guidance in secondary schools, the role of school administration and physics teachers in influencing girls enrollment in physics. This section presents the findings and discussion in relation to the objectives of the study.

4.2 Girls Attitude towards Physics

The researcher sought to find out if an attitude of the girls towards physics was a factor that has led to low enrolment in the subject. Information on attitudes was gathered from girls who chose to continue with physics and those who dropped and thus enabling the researcher to capture the general overview of girls' attitude towards physics as a subject and its allied careers. The researcher used a five point likert attitude scale to get information on girls' attitude towards physics. Each attitude statement was analyzed and the summary is as shown in Table 4.1.

Table 4.1 Summary of Girls Attitudes towards Physics

Attitude Statement	Mean	Std Deviation
Physics is one of the most useful subjects	2.16	1.302
Everybody should have the basic physics knowledge	2.42	1.310
I enjoyed physics lessons in form 1and2	2.42	1.423
Physics is not the most difficult subject among the three sciences	2.61	1.356
Physics teachers are very supportive in solving questions	2.40	1.182
Calculations encountered in physics are not very difficult to solve	2.92	1.305
Girls understand physics as well as Boys do	2.52	1.385
There are many physics oriented careers where girls can fit	2.62	1.428
Physics teachers are very effective in making understanding of physics possible	2.00	1.201
You do not have to be excellent in mathematics to do physics	2.38	1.200
Overall Mean of Means	**2.37**	
Overall Standard Deviation of Means		**1.272**
n=240		

The responses were coded on a scale of 1 to 5 where 1 is a code for (Strongly Agree); 2 for (Agree); 3 for (Undecided); 4 for (Undecided); and 5 for (Strongly Disagree). The questionnaire attitude statements were constructed in such a way that if a computed mean response code for an item:

a) fell between 1 and 2, then a strong positive attitude is inferred
b) fell between 2 and 3, then an attitude that is just positive is inferred
c) fell on 3, then a neutral attitude is inferred
d) fell between 3 and 4, then an attitude is just negative
e) fell between 4 and 5, then a strong negative attitude is inferred

From table 4.1, all the means for all attitude statements fell between 2 and 3 giving an overall mean of 2.37 and standard deviation of 1.272. This showed that girls had a just positive attitude towards physics. Therefore, girls' low enrolment in physics was largely not due to their attitude but rather to some other factors. This finding was in disharmony with Musyoka (2000) who found that girls attitude towards physics was generally negative. The change of attitude by girls towards physics can be attributed to the government's several changes of the curriculum. Since year 2000, several topics have been removed from the physics syllabus, numerical calculations reduced and new gender sensitive textbooks have been published. Physics teachers, head teachers and other stake holders should now seize the opportunity and utilize the girls' positive attitude to enroll more girls in physics.

Null hypothesis one was designed to determine whether there was significant difference between the girls mean attitude towards physics when categorized by type of schools attended (i.e. co-educational or girls' only schools).

The researcher wanted to know whether the differences such as provision of physical facilities, students' entry behaviour, and teacher characteristics that existed in the two categories of schools had any significant influence on girls' attitude towards physics.

The hypothesis was tested by use of independent samples T-test. This test was preferred because the two groups were randomly drawn from normally distributed and independent samples of girls from co-educational and single sex girls' only schools. Table 4.2 shows the independent samples T-test output.

Table 4.2 Independent Samples T-test of Girls Mean Attitude Scores towards Physics when Categorized by Type of School

		T-test for Equality of Means		
		Sig.	t	df
MAS	Equal variances assumed		-2.155	238
	Equal variances not assumed	0.018	-2.386	209.285

n = 240

Table 4.2 shows that the result was statistically significant ($t = -2.386$, $p<0.05$). A sig. (p-value) of 0.018 meant there was some evidence against the null hypothesis. The researcher therefore, rejected the null hypothesis and concluded that there was a statistically significant difference in mean attitude scores for girls in girls' only schools and mean scores for girls in co-educational schools.

Girls in single sex schools were more positive towards physics possibly because they scored higher marks in physics, had well equipped laboratories, their teachers were found to be more supportive and above all they had a provision of doing all science subjects.

4.3 Availability and Effectiveness of Career Guidance and Counseling Services

Ndungu (2007) asserted that there is a need to focus on the status of career guidance and counseling at secondary school level with a view of assessing how students make subjects choices and career choices. Globalization and continued rising of competitiveness are major challenges for the youth today. As such, provision of career guidance in educational institutions is a vital tool that students can use to sort out and order their views and decisions about the intended careers.

In order to establish the students' awareness of career guidance in their schools, the researcher asked several questions. Table 4.3 shows the students responses.

Table 4.3 Students awareness of career guidance in their Schools

Question	Frequency				Total	
	Yes	%	No	%	N	%
Do you have career guidance and counseling in your school?	144	60.0	96	40.0	240	100.0
Do you know the career master in your school?	104	43.3	136	56.7	240	100.0
Have you ever consulted the school counselor on career issues?	68	28.3	172	71.7	240	100.0

n = 240

A large number of students represented by 60 % said they have career guidance and counseling services in their schools. The other 40 % of the students' response meant that either they were not aware of existence of career guidance or there was none in their schools. According to the analyzed data gathered from head teachers, all the twelve schools visited by the researcher had active general guidance and counseling departments but only three had a separate department for specifically career guidance and counseling. In each of the other nine schools, the career counselor had no established programme or was the same person in charge of the general guidance and counseling department in the school.

Mmbone (2008) found that when career, spiritual, and students' psychological issues are handled by the same person and are under the same department, students tend to seek assistance mostly on issues such as sexual relationships, adolescence maladjustment, conflicts in certain faith, and family problems. Very few students visit the counselor to be guided on academic and career matters. Thus, in order for the students to benefit fully from career guidance services in the school, it is important to establish a distinct department which should specialize in career issues and also take the centre stage in guiding students on subjects' selection in form two.

Despite the fact that all the twelve schools had career counselors, when students were asked whether they knew the career master in their schools, the responses indicated that 56.7 % of the students did not know their career counselors. This implied that although some students were aware of the presence of career guidance and

counseling services, they did not know the teacher in charge. Further, it can be deduced that there are no forum in such schools where career issues are discussed and above all students' career consultation is non existent. This state of inactivity in career guidance and counseling department in many schools was further confirmed by 71.7 % of students' respondents who said they had never consulted the school counselor on career issues.

4.4 School Administrators influence on girls' enrolment in physics

This study sought to find out the role played by the school administration which influences girls' enrolment in physics. This influence may be positive or negative. The research mainly focused on the head-teacher as the chief school administrator and the academic master or the dean of studies in a school. These are the other two people apart from the career counselor and the physics teacher who may directly have influence on the students' enrolment in physics.

The head teacher as the school chief executive is responsible for the smooth running of all departments in a bid to implement the curriculum as specified by the Ministry of Education. Since the main output is measured in terms of the number of students who attains the pass mark of grade C+ and above, then the effectiveness of the school academic programme takes precedence of all the other programmes. The head teacher must ensure that students are taught, textbooks and other learning facilities are adequate and students are motivated to learn. This can only be realized through supervision of both teachers and students. According to KIE (2005), one of the most important areas in secondary schools curriculum implementation is the subjects' selection in form three as per the MOE revised curriculum circular of 2002. According to the circular, students are supposed to be guided on how to select and then pick the subjects of their interest. Owing to their busy schedules many head teachers have delegated this important task to heads of schools academic departments.

In order to find out whether the manner in which subjects' selection exercise was done had an influence on physics enrolment, students, teachers and head teachers were required to respond to the statement that students' subjects' selection was free and fair. Table 4.4 shows their varied responses.

Table 4.4 Students, Teachers and Head-teachers Responses on students' Choice of Subjects being Free and Fair.

Response	Students		Teachers		Head-teachers	
	f	%	f	%	f	%
Strongly Agree	48	20.0	1	8.3	6	50.0
Agree	64	26.7	3	25	4	33.3
Undecided	18	7.5	5	41.7	2	16.7
Disagree	40	16.7	2	16.7	------	-----
Strongly Disagree	70	29.2	1	8.3	------	-----

n = 240 for Students, 12 for Teachers and 12 for Head-teachers

It is quite evident from Table 4.4 that majority of head-teachers considered the manner in which the students' subjects section exercise was done as completely free and fair. Fifty percent of them strongly agreed while 33.3% agreed to the statement. Only two head-teachers were none committal. Conversely, students and teachers responses did not rate the subjects' selection so highly. Only four teachers found the selection exercise as free and fair, five teachers were undecided, two teachers disagreed while one teacher strongly disagreed. Thus, eight teachers did not term the exercise as free and fair and therefore casting aspersions into head-teachers honesty. It is possible that the five teachers who remained undecided had conflicts in making the decision since they felt as an act of betrayal to their seniors if they disagreed that the selection exercise was free and fair.

The students' response was almost divided equally between those who found the subjects' selection free and fair and those who did not. By considering the number of students who disagreed and the undecided comprising 53.4 %, it could then be deduced that there is an urgent need for the head-teachers to find out why so many teachers and students are dissatisfied with the way subjects selection was done.

A null hypothesis was designed to test whether there was significant relationship between head-teachers teaching subjects and competence in guiding students in science subjects' selection. The study sought to establish whether head-teachers who were trained to teach science subjects were better placed to guide and counsel students on how best to select and combine the science subjects than head-teachers who were not trained to teach science subjects. The null hypothesis was tested using Chi-Square of independence. This method was found appropriate because it is a statistical technique that attempts to establish relationship between two variables both of which are categorical in nature.

The three levels of competence to which the head-teachers responded were excellent, just competent and slightly competent. The level of being excellent meant that the person had up to date skills and knowledge about different science oriented courses and careers, and the dynamics in the job market. Table 4.5 presents the results

of cross tabulation of head-teachers teaching field and their own rating of competence in guiding students in science subjects' selection.

Table 4.5 Cross Tabulation of Head teachers Teaching Subjects and the level of Competence in Guiding Students in Science Subjects Selection

	Level of Competence			
Teaching Subjects	Excellent	Just Competent	Slightly Competent	
	f	f	f	Total
Sciences	2	2	1	5
Arts	1	4	2	7
Total	**3**	**6**	**3**	**12**

n=12

Table 4.15 shows that two head teachers who were trained to teach science subjects rated themselves as excellent in having knowledge and skills of guiding students in science subjects' selection while two were just competent, and one slightly competent. On the other hand, three head teachers who trained in arts subjects also rated themselves as excellent, four as just competent and two as slightly competent in possessing knowledge and skills in guiding students in selecting science subjects in line with their aspired careers. Conducting a Chi-Square test of independence would tell us if the observed pattern is statistically different from the pattern expected due to chance. Table 4.6 shows the output of Chi-Square test.

Table 4.6 Chi-Square Test of Independence in Head-teachers Teaching Subjects and Level of Competence in Guiding Students in Science Subjects Selection.

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.900	2	.627

n=12

The small Chi-Square statistic (0.900) and its high significance level of 0.627 ($p > 0.05$), indicated that there was no evidence against the null hypothesis. Therefore, the researcher concluded that there was no relationship between head-teachers teaching subjects and their level of competence in guiding students in science subjects' selection. This implied that all head-teachers regardless of teaching subjects should endeavour to acquire the relevant information and skills to enable them to guide and counsel students how to select subjects appropriately in line with their aspired careers. It means they have to spend funds on acquiring the most current pamphlets on careers, magazines, provision for accessing internet and attending career fairs.

4.5 Physics Teachers' Influence on Girls Enrollment in Physics

Teachers' behaviours and attitudes are a key influence on a student attitude, motivation, achievement and continuing participation (Labudde, 2000). Krogh and Thomsen's (2005) found that in physics, girls' relationships with their teachers are more significant for their learning than are boys' relationships with teachers. Therefore, based on these important findings, the researcher sought information about physics teachers influence on girls' enrolment in physics in Kajiado North District.

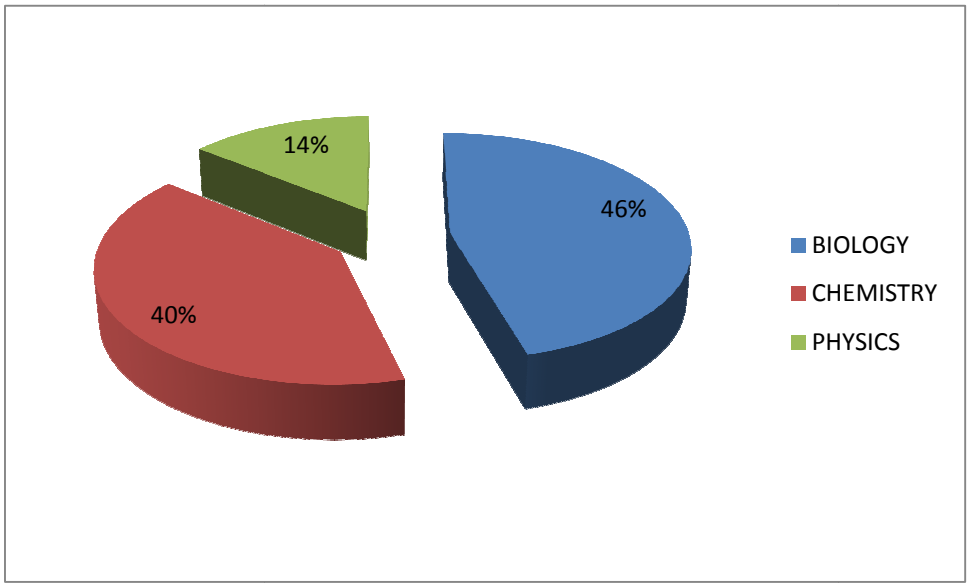
Apart from having a positive attitude towards girls in physics, physics teachers need to be more innovative and effective in subject matter delivery in order to capture and retain interest of many girls. One of the key determinants of students' attitudes to physics is their experience of school physics (Sharp, 2004). In cognizance of this fact, the researcher observed several physics practical sessions and came up with the following findings:

a) In a practical lesson teachers are expected to introduce the session formally. In doing so they link the practical with theoretical work that he or she might have taught in class. However, it was noted that most of the teachers did not introduce the session formally but just gave the laboratory assistance the practical instructions handouts to pass them to the students.
b) Some apparatus were not put on the practical bench and students kept requesting the laboratory assistance to avail them, thus, wasting a lot of time.
c) Students were required to be in groups of four but some groups were clouded with Six to ten students where one student was handling the apparatus provided while others watched.
d) In most cases, the physics teacher was in the preparation room chatting with the laboratory assistance or outside the laboratory.
e) In mixed schools, boys dominated in handling apparatus while some students were discussing other issues unrelated to the practical being conducted.

These findings indicated that the way physics practical were conducted was neither interesting nor motivating at

all and students especially girls were most likely be less eager to continue with physics beyond form two. The finding was further affirmed by the students' response when they were asked to indicate the practical sessions that they enjoyed the most in forms one and two giving reasons. Figure 4.1 shows their responses.

Figure 4.7 Girls Response on the Practical Sessions they enjoyed most in Forms One and Two



The girls' response made it clear that physics practical were the least enjoyed. Most of the students about 45.8 % (110) enjoyed biology the most, followed by chemistry with 40 % (96) while only about 14.2 % (34) enjoyed physics the most. Physics practical lessons observation revealed that most of the physics teachers did not accord their students the necessary assistance. They assumed that because most of physics practical do not involve dangerous chemicals and heating, students close supervision was not necessary. Students spent a lot of time trying to link the practical with the leant theory, looking for missing apparatus and tying to find their way through the disorganized laboratory. When students crowd in one place, most of them fail to handle the given apparatus and although she may still compile the results correctly, the feeling of not being able to handle apparatus on her own may prompt her not to continue with the subject. Though it is important to train students to read instructions, interpret and conduct experiment on their own, long absence of their teacher is perceived by students as an act of being unconcerned and unfriendly to them.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The main aim of the study was to find out the determinants of girls' low enrollment in physics in Kajiado North district secondary schools. Based on the findings from this study, the following conclusions were made:-

a) Girls' attitude towards physics is positive. However girls in single sex schools were found to be slightly more positive than girls in mixed schools and hence likely to choose physics oriented career.

b) There was statistical difference in mean attitude scores towards physics for girls in co-educational schools and girls in single sex girls schools ($t=-2.386$, $p<0.05$). . This difference could partly be explained by the extent of support and concern accorded by teachers from these two categories of schools. Physics teachers in mixed schools were found to be more impressed by boys who most often scored higher marks in physics and mathematics than girls. They had also higher expectations in the boys to make their subjects to shine in the KCSE examination.

c) Most secondary schools have no programme on career guidance and counseling. This implies that career guidance is just an afterthought and is done only during students subjects selection exercise.

d) Majority of career counselors have very scanty knowledge on the current trends in job market, careers associated with different science subjects' combinations, the remuneration expected in various careers and the working conditions and terms of employment in different careers.

e) All the head teachers' respondents accepted that there is need for concern due to low girls' enrolment in physics. They further affirmed that low girls enrolment in physics will definitely jeopardize one of MDGs of achieving gender equity and equality at all educational levels and employment by 2015

f) Most head teachers have apathy towards students' subjects' selection and career issues. Further, head teachers' competence in guiding students on science subjects selection has no relationship with the subjects they were trained to teach (Pearson Chi-Square=.900, df=2, $p>0.05$)

g) Most of physics teachers are not supportive to students during practical sessions. In mixed schools boys dominated in handling apparatus.

5.2 Recommendations

Guided by the findings of the study, the researcher recommended the following:-

i) In order to cultivate more positive attitude in girls towards physics, physics teachers should be gender sensitive and use teaching methods and strategies tailored to specifically encourage more girls to continue with physics but at the same time not to discourage boys. Physics teachers should show concern and be physically present during physics practical to enable girls to fully participate, grasp and conceptualize both concrete and abstract concepts.

ii) To reduce the effect of peer influence and the deeply embedded gender career stereotyping on science subjects selection, students should be exposed to a lot of information about different courses and the associated careers. This can only be achieved by strengthening the school career department.

iii) Head teachers as the chief school administrators need to take charge and demonstrate prudent leadership by supervising subjects' selection exercise as one of the most important part of curriculum implementation. Through supervision they would witness the thorny issues that are oppressive to students.

iv**)** The Ministry of Education through Quality Assurance and Standards Officers should monitor the way subjects' selection is done in schools to ensure that students' rights are not violated.

5.3 Suggestions for further Research

Though each student must enroll in at least two science subjects in secondary education, the numbers girls pursuing science courses in higher education is still low. Therefore the researcher recommends a study to be undertaken to unearth determinants of low enrollment in undergraduate science and technology courses.

REFERENCES

African Union Commission (2007), *The Johannesburg declaration of the first African Union conference on women in science and technology.* Retrieved April 24, 2013 from http://www.nepadst.org/doclibrary/pdfs/amcest3_013_nov2007.pdf

Baguma P, Muhairwe M. (1999). *The factors influencing the choice of science subjects by female secondary schools students in Uganda at senior three level,* Nairobi: African Academy of Sciences.

Chege, F, Sifuna, D. (2006). *Girls' and women's education in Kenya: Gender perspectives and trends* .UNESCO Publication.

Francis, B. (2002). Is the future really female? The impact and implications of gender for 14-16 year olds' career choices. *Journal of Education and Work, 15*(1), 28 – 41.

Gachathi, J. P. (1976). *Educational objectives and policies*, Report of the National Committee. Nairobi: Government Printer.

Gall M. D, Borg, W. R., & Gall, J. P. (1996). *Educational research: An introduction*. New York: Longman.

Kelly, A. (1987), *Science for girls*? London: Open University Press.

Kenya National Bureau of Statistics (2012), Kenya population Census report: Nairobi. Government Printer

Kenya National Examination Council (2006), *KNEC 2006 Report, KCSE Candidates performance analysis*. Nairobi: KNEC.

Kinaiya D S. (2008). *Secondary school teachers' perceptions towards supervision by Quality Assurance and Standards Officers in Narok North District, Kenya,* Unpublished MEd Thesis, University of Nairobi.

Kombo, D. K., & Tromp, D. L. (2006). *Proposal and thesis writing: An introduction.* Nairobi: Paulines Publications Africa.

Krogh L B, Thomsen P (2005), Studying students' attitudes towards science from a cultural perspective but with a quantitative methodology border crossing into the physics classroom. *International Journal of Science Education,* 27(3) 281–302.

Labudde, P. (2000). Girls and physics: Teaching and learning strategies tested by classroom interventions in grade 11. *International Journal of Science Education, 22(2),* 143-157

Lee, J. D. (2002). More than ability: Gender and personal relationships influence science and technology involvement. *Sociology of Education, 75(4)* 349–373.

Luzzo, D. A., James,T., & Luna, M. (1996). Effects of attributional retraining on the career beliefs and career explorational beha viour of college students. *Journal of Counseling Psychology, 43(4)*, 415-422

Makinde, O. (1984), *Fundamentals of guidance and counseling*. London: Macmillan Education

Mbiti D M (2007). *Foundations of school administration (Revised edition).*Nairobi: Oxford University Press.

McMillan, H. J. (1991). *Educational research*.VG: Harper Collins.

McMillan, H. J., & Schumacher, S. (2001). *Research in education* (5th ed.). London: Addison Wesley Longman.

Ministry of Education (1973) *Handbook for schools guidance counselors*, Nairobi: Jomo Kenyatta *Development Plan (2002-2008): Effective management for sustainable economic growth and poverty reduction*. Nairobi:

Government Printers.
Mmbone, J. A. (2008). The *effects of guidance and counseling on students' academic achievement: A case study of secondary schools of Navakholo Division, Kakamega District*. Unpublished MEd Thesis, Catholic University of Eastern Africa
Muli, M. M. (2005). *Effects of head teachers' management styles on performance in physics at KCSE examination in Mutomo Division Kitui District*: Unpublished MEd Thesis, University of Nairobi.
Munguti, B. (1984). *A survey of factors affecting the teaching and learning of mathematics in primary schools in Mbooni, Machakos district,* Unpublished MEd Thesis, Kenyatta University.
Munguti S. (2004**).** *Determinants of the choice of physics by girls at secondary school level in Makueni District, Kenya*, Unpublished MEd Thesis University of Nairobi
Murphy P, Whitelegg, E. (2006). *Review of research on girls' participation in physics*. Retrieved February 24, 2009 from

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