

**FACTORS INFLUENCING ENROLMENT AND RETENTION OF
STUDENTS IN PHYSICS IN SECONDARY SCHOOLS IN IMENTI
SOUTH SUB-COUNTY KENYA**

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in Science Education of Chuka University**

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DECLARATION AND RECOMMENDATIONS

Declaration

This thesis is my original work and has not been previously submitted for the award of a diploma or conferment of a degree in any Institution.

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DEDICATION

I dedicate this work to my dear husband Joseph Mutembei for his unfailing love and moral support all along. To my son Ian Mugambi for his endurance and understanding and my daughters, Peace joy Nkatha and Shirleen Kinya for their enduring throughout this journey.

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ABSTRACT

Despite the place of physics in science, technology and national development, the number of students taking physics as their choice in secondary schools is declining. The purpose of this study was to investigate factors influencing enrolment and retention of students in physics classes in secondary schools in Imenti South Sub-County of Meru County. The study was based on achievement motivation theory. The study adopted descriptive survey research design. The target population was 14,097 subjects comprising of 13,943 students and 154 physics teachers in secondary schools in Imenti South Sub-County. Simple random sampling technique was adopted to select students and physics teachers from the population in Imenti south Sub-county. The sample size was 364 respondents comprising of 356 students and 8 physics teachers. Data was collected by use of three questionnaires, for the form two students, form three students and the other for the physics teachers. Piloting was carried out in two secondary schools in the neighbouring Imenti North Sub-county where 42 students and 4 physics teachers participated. Spearman Brown formulae was used to estimate the reliability co-efficient of the instruments. The reliability coefficient of 0.851 and 0.957 for students and teachers questionnaire respectively was obtained. The research instruments were validated with the help of supervisors. The data collected was cleaned, coded and entered into the computer for analysis. Statistical Package for Social Science version 18 was used for data analysis. The data was analyzed using descriptive statistics and the findings presented using tables, graphs and charts. The study established factors influencing enrolment and retention in physics include; lack of adequate teaching and learning apparatus, poor performance in physics, teaching methods used in practical lessons, playing with electrical gadget and making models during early childhood, naming constants and principles after male scientists. The research findings will provide important information to policy makers and other stake holders in the Ministry of Education on the influence of available teaching and learning physics resources in schools in regard to enrolment and choice of physics. The study will provide information to physics teachers on the influence of the methodologies used in teaching physics on selection of physics by the students. This may help physics teachers to know which intervention measures to take while teaching in order to improve student's enrolment in physics. The study is of significance to the students because it enlightens them on the importance and the benefits of studying physics. The study also will sensitize the parents on the importance of physics and their role in exposing children to experiences that demonstrate physics knowledge during childhood. This will help in improving enrolment and retention of students in physics in secondary schools.

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ACRONYMS AND ABBREVIATIONS

KCSE	-	Kenya Certificate of Secondary Education
KIE	-	Kenya Institute of Education
KNEC	-	Kenya National Examination Council
MOEST	-	Ministry of Education Science and Technology
NACOSTI	-	National Commission for Science Technology and Innovation Organizations
SMASSE		Strengthening Mathematics and Sciences in Secondary School Education
SPSS	-	Statistical Package for Social Sciences
SSSCE	-	Senior Secondary School Certificate Examination
STEM	-	Science, Technology, Engineering and Mathematics
UK	-	United Kingdom
UNESCO	-	United Nations Educational Scientific and Cultural
WAEC	-	West Africa Examination Council

CHAPTER ONE INTRODUCTION

1.1 Background Information

Science education is important to the technological development of any nation and that is why every developing nation needs to emphasize it all institutions of learning (Omosewo, 2013). Omosewo further argues that many of the developed countries were able to achieve so much in science and technology because of science education. Throughout history the development of new technology has been absolutely vital for both human survival and progress. According to Muli (2012), one of the main tools with which human beings adapt to changing conditions is the discovery and utilization of new technologies. Muli adds that since technology is the primary vehicle through which humanity progresses, it could serve to reduce much of the problems facing human beings such as world hunger, poverty, lack of access to education and health issues. According to Salleh (2004), advancement in science and technology is coupled with the deterioration of the ecosystem and greater use of chemicals and technologies that affect our health systems; hence, physics knowledge and understanding is crucial since it helps in understanding the physical world around us.

Physics is very important because it is one of the sources of skills and attitudes required for the development of technology. According to Hodson (1991), Physics enables its learners to be active consumers of technological gadgets that have infiltrated many of the daily activities such as radios, remote controls, computers and its peripherals. Hodson adds that simple arrangement of cells in a torch; musical system and ordinary artisan require some knowledge of physics. According to Musasia (2012), Physics plays an important role in technological advancement, promoting national wealth and health and accelerating industrialization. Vadya (2003) points out that, most aspects of engineering, whether mechanical or new fields of chemical and biological engineering require knowledge of physics. Omosewo (1997) further argues that, Physics enables individuals to cope with the rapidly changing society as a result of advances in technology and for a country's economic progress.

This shows the critical role that physics plays to individuals and society at large and investment required by a country in physics education. Despite the importance attached to physics, research has shown that student's enrolment in physics is low worldwide (Lyon, 2005). According to Robinson (2006) Australia and much of the western world have raised concern about the low enrolment in physics at senior secondary level. Studies by Bolstad and Hipkins (2005) in New Zealand, Lyons (2006) in Australia, Smither and Robinson (2006) in the UK, observe that the number of senior students who choose physics is relatively small and has shown a declining tendency. Research has also shown that the interest of students in physics is declining (Oliver, 1990, Trumper, 2006, George, 2000). In china, Chinese scholars have pointed out that Chinese students generally feel senior secondary physics is difficult, uninteresting and irrelevant to life experience (Zhu, 2007).

Further studies by Adegoke 2010 show that enrolment figures of students in physics at the secondary school level in Nigeria are quite low. For example, between 2005 and 2009, on the average, less than 30% of the total students who registered for senior secondary school certificate examination (SSSCE) registered for physics (The West African Examination Council (WAEC), 2009). This phenomenon of low enrolment in physics education seems to cut across the world (Kim & Ogawa, 2007). Hence, the number of students who decide to pursue courses that require physics in universities is very low. Thus, there is need to reverse the trend of low enrolment in physics to avoid a shortage of skilled manpower to work in industries especially in developing countries.

The number of students attending high schools in Kenya has increased but the percentage enrolling in the physics course continues to drop. The number of students enrolling for physics has been dropping since 1990's, with some schools not offering physics at all (KNEC, 2002). This trend negates one of the major objectives of the 8.4.4 curriculum, which is to equip learners with relevant scientific and technical skills to enable them to become self-reliant (Republic of Kenya, 1985). In Imenti South Sub-County, very few students take physics as their science of choice (Sub-County Education Office, 2014)

Table 1 shows enrolment of students in sciences in Imenti South sub-County at KCSE level.

Table 1

Enrolment in Sciences in Imenti South Sub-County

Year	Total Candidates	Physics Entry	%	Biology Entry	%	Chemistry Entry	%
2009	3015	723	23.98	2627	87.13	2930	97.18
2010	3305	741	22.42	2909	88.26	3211	97.15
2011	3530	785	22.23	2916	82.60	3433	97.25
2012	3643	813	22.32	3029	83.14	3488	95.75
2013	3721	816	21.93	3312	89.00	3542	95.19
2014	3942	849	21.54	3510	89.04	3798	96.35

Source: Imenti South District Education office (2014)

The information in Table 1 shows that whereas Biology and Chemistry have continued to register candidature above 82% and 95% respectively physics has registered a minority of between 21% and 23%. The number of students enrolled in physics has remained less than half of the total number of the students in Imenti south Sub-County and this raises concern as to what causes the low enrolment in physics. In view of this trend, there is need to find out factors influencing enrolment and retention of student in physics. Results of a study by Kireria (2007) focused on the factors influencing form two students in their choice of optional subjects in Mwimbi Division, in Meru South Sub-County. However, the study did not focus on enrolment in physics. Results of Studies by Musyoka (2000), Mungiti (2004), Gacaria (2007), and Njuguna (2009) mainly focused on factors influencing girls' enrolment in physics excluding boys. Even though research has been done specifically on students' low enrolment in physics by Kageema (2005), Muharo (2011) and Muli (2012), there is no research that has been done in Imenti Sub-County. There is therefore, a knowledge gap on what influences students choice of physics in secondary schools. Hence, this study will focus on factors influencing enrolment and retention of students in physics in secondary schools in Imenti South Sub-County in Meru County.

1.2 Statement of the Problem

Physics plays an important role in technological advancement, promoting national wealth and health since it is one of the sources of skills and attitudes required for the development of technology. The Kenya secondary school physics emphasizes experimental approach which prepares the learner to teaching and learning scientific concepts and ideas in the modern technology. Therefore, by the end of the course the learner is expected to contribute to the technological and industrial development of the nation. Despite the importance of physics and the general increase in enrolment of students in secondary schools due to free primary and day secondary schools, enrolment in physics in secondary schools has remained low all over the country and Imenti south Sub-County has not been exception. The low enrolment of students in physics is not only a source of concern to secondary schools stake holders but also to the nation like Kenya which aspires to accumulate competent human capital in science and technology. Thus, there is need to assess the limited information on what influences enrolment and retention of students in physics in secondary schools in Kenya, to enable the stakeholders to put measures in place to improve the number of students registering for physics who can later on take part in preparing the country for industrial take off. Hence, the current study investigated factors influencing enrolment and retention of students in physics in secondary schools in Imenti South Sub-County, Meru County, Kenya.

1.3 Purpose of the Study

The purpose of this study was to determine the factors influencing enrolment and retention of students in physics in secondary schools in Imenti South Sub-county in Meru County.

1.4 Objectives of the Study

This study was guided by the following objectives:

- i. To investigate factors related to school-based experiences that influence enrolment and retention of students in physics in secondary schools in Imenti south sub-county.

- ii. To determine factors related to early childhood experiences that influence enrolment and retention of students in physics in secondary schools in Imenti south sub-county.
- iii. To investigate factors related to socio-cultural experiences that influence enrolment and retention of students in physics in secondary schools in Imenti south sub-county.

1.5 Research Questions

The research questions formulated to achieve the study objectives were:

- i. What factors related to school-based experiences influence enrolment and retention of students in physics in secondary schools in Imenti south sub-county?
- ii. What factors related to early childhood experiences influence enrolment and retention of students in physics in secondary schools in Imenti south sub-county?
- iii. What factors related to socio-cultural experiences influence enrolment and retention of students in physics in secondary schools in Imenti south sub-county?

1.6 Significance of the Study

The findings of the study will provide important information to the curriculum developers on the availability of teaching and learning physics resources in schools and how they are being utilized. This will empower the Ministry of Education to come up with strategies to improve the teaching and learning of physics thereby ensuring maximum utilization of the available resources. The findings of the study will be useful to policy makers and stakeholders in the education sector to help put policies in place which may increase the number of students who will opt to study physics. The study may help the school administrators to identify the causes of low enrolment of students in physics in schools and address them to improve enrolment and retention of student in physics classes. The findings will also benefit physics teachers by acting as a self-assessment instrument on the impact of the methodology they use to teach physics on selection of physics by the students. This may help

them to know which intervention measures to take in regard to how they teach in order to improve student's enrolment in physics.

The study is of significance to the students because it enlightens them on the importance of physics and the benefits of studying physics. The study will sensitize the parents and communities on the importance of physics and their role in influencing students' choice of physics. This will enable them to play their role in exposing their children to experiences that demonstrate physics knowledge. The findings may also provide basis for further research.

1.7 Scope of the Study

The study sought to determine the factors influencing enrolment and retention of students in physics in secondary schools in Imenti South Sub-County. The researcher focused on three factors, namely: early childhood experiences, school based experiences and social cultural experiences and their influence on enrolment and retention of students in physics in secondary schools. The respondents were Form Two and Form Three students, and physics teachers. The study was carried out in selected public secondary schools in Imenti South Sub-County in Meru County.

1.8 Assumptions of the Study

The study was based on the following assumption:

- i.** The institutions under study had taken competitive strategies to increase enrolment and retention of students in physics.
- ii.** The respondents gave truthful, genuine and honest information worth to be based on in making conclusion and recommendations.

1.9 Definition of Terms

The following is the operational definition of terms used in the study:

- Attitude:** Mental view, opinion and behavior towards a certain aspect or occurrence. In this study it is the sum total of student's feelings, bias and pre conceived convictions that influences his or her choice towards learning physics
- Enrolment:** Refers to the act of making someone officially a member of a group, society or institution by registration. In this study is the total number of students who have registered for physics course for examination at KCSE level
- Experience:** The knowledge and skill gained through doing something for a period of time. In this study it is the knowledge a student acquires at home or school that influences his/her choice of physics.
- Factors:** Refers to all the activities done either socially, economically or politically and their influent to the students.
- Gender:** Refers to differences between boys and girls in social cultural aspects other than the biological differences only. In this study it is a student being either male or female.
- Influence:** The effect that something or somebody has on the way a person thinks or behaves. In this study it is the effect the students may acquire from his/ her environment in school or at home that may affect his/her choice of physics. .
- Peer:** People of the same age and social status. In this study, is a person engaged in study, devoted to learning and attends secondary school.
- Physics:** Branch of science that deals with matter energy motion or force
- Resources:** Things (materials, equipment's, facilities) which give help to both teachers and students in schools to increase efficiency during the teaching and learning process. In this study it is the laboratories, books and practical apparatus to be used in the teaching and learning of physics.

- Retention:** The action of keeping something rather than losing or stopping it. In this study it is maintenance or retaining of the initial number of physics students from form one until they sit for final examination (KCSE).
- Science subjects:** Any of the subjects' Biology, Physics or Chemistry that are taught in secondary schools in Kenya.
- Secondary school:** A school for young people between the ages of fourteen and eighteen. In this study it is a school that is intermediate in level between college and that offers general, technical, vocational, college- preparatory curricula.
- Student:** A person studying in a school, college or university. In this study is a person in secondary school expected to sit for KCSE
- Technology:** Purposeful application of information in the design, production and utilization of goods and services and in the organization of human activities.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The chapter reviewed related literature on enrolment and retention of students taking physics in secondary schools under the following sub-heading: science education, national students enrolment in sciences in Kenya certificate of secondary education, role of physics in the society, role of physics in industrialization, and factors that influence student's choice of optional subjects which include learning resources, teachers influence , peer influence, career orientation, student performance, school policy, early childhood experiences, gender stereotyping and cultural practices. The chapter presents a theoretical framework that will guide and strengthen the study as well as the conceptual framework of variables under study.

2.2 Science Education

Each country needs sufficient supply of high school graduate with an adequate knowledge of science to sustain its scientific and technological development as well as its economic well-being (Keeves, 1999). Theories in economics and sociology link the level of scientific and technological development in a country with its national development (Opare, 1996). Generally, Science and Technology Education (STE) are regarded as a vehicle for economic and social development in a country (Shumba, 1993). However, scientific and technology development cannot be achieved unless the necessary scientific infrastructure is put in place, which in itself presupposes an adequate system of education. Based on this premise the government of Kenya has put in place policies on education geared towards achieving quality education and training for its citizens to ensure overall success in its development strategies (Republic of Kenya, 2005).

One of the prime aims of modern science education is to enhance creativity among learners (Okere, 1996). Modern society needs active and responsible citizens; individuals who can assimilate information from multiple sources, determine their veracity and make judgments (Wilson, 2000). This means science education should help learners develop ability to reason, understand and bring out their ability to use inventively and originally the theoretical knowledge and skills acquired.

Kerich (2004) pointed out that over and above certification, science education in secondary schools should yield “finished learners”, that is learner’s who have acquired knowledge, new practical skills and new desirable attitudes. In Kenya education is expected to impact on the student the necessary knowledge and skills required for national development as well as inculcate the right attitude to work and administrative skills necessary for a smooth transitional process of a developing country (Republic of Kenya, 1981; KIE, 1992). The government of Kenya as unveiled its grand plan (vision 2030) for changing the country into a newly industrializing, middle income country providing high quality life for its citizens by the year 2030 (Republic of Kenya, 2007). This implies that, there is need to improve enrolment in science subjects like physics to realize the projected goals.

2.3 National Students Enrolment in Science Subjects in Kenya Certificate of Secondary Education

The current system of education in Kenya secondary schools requires that a student be examined in at least seven subjects in form four. These subjects are classified into groups; group one, two, three and four. KNEC policy on subject selection criteria, a student has an option of choosing any two, or all the three subjects in group two, according to students’ preference (KNEC, 2005). It has been noticed from previous examinations that most students prefer to opt for chemistry and Biology when choosing the two subjects from group two (KNEC, 2012). This trend has been there since 2001, when the ministry of education, science and technology, decided to reduce the minimum number of examinable subjects from eight to seven.

Table 2 shows the relative enrolment nation – wide for the three subjects between the years 2009 – 2014 (KNEC, 2009, 2014).

Table 2

Enrolment in Sciences Nationwide

Year	Total	Subject	Candidates	Percentage Candidature
2009	337404	Biology	299302	88.71
		Chemistry	329730	97.72
		Physics	104883	31.08
2010	357488	Biology	317135	88.17
		Chemistry	348680	97.53
		Physics	109911	30.72
2011	413718	Biology	363817	87.94
		Chemistry	403107	97.43
		Physics	120093	29.03
2012	436349	Biology	386538	88.58
		Chemistry	427303	97.93
		Physics	118508	27.16
2013	446696	Biology	397319	88.94
		Chemistry	439765	98.45
		Physics	119819	26.82
2014	483630	Biology	432977	89.53
		Chemistry	476582	98.54
		Physics	131410	27.17

Source: KNEC (2010-2014)

According to the enrolment figures indicated in Table 2, physics enrolment has been less than 30.72 % in all the years under consideration. Within the same period, enrolment in the other competing subjects i.e. Chemistry and Biology, have registered above 88% with Chemistry emerging as the most preferred subject of the three. It is not clear why the candidates generally avoid Physics more than the other two science subjects though the three sciences are given the same status during subject selection. This study therefore, seek to find out the reasons why students avoid physics, while preferring to enroll for Biology and chemistry, as indicated by the KNEC reports (KNEC, 2009 – 2014).

2.4 Role of Physics in Society

Physics has a significant role to play in the society, since it touches every aspect of our lives (Zhaoyo, 2002). Physics involves the study of matter, energy and their interactions (Vadya, 2003). According to Hodson (1991), scientific discoveries made in the past by physicists, such as magnetism, electricity and conductors have made modern conveniences, such as television, computers, cellular phones and home technologies possible. Modern means of transportation, such as air craft and telecommunications have also drawn people across the world close together all relying on concepts of physics (Amunga, Musamusia & Museva, 2011). Physics also improves quality of life by providing the basic understanding necessary for developing new instrumentation and techniques for medical applications, such as computer tomography, magnetic resonance imaging position emission tomography, ultra sonic imaging and laser surgery (Zhaoyo, 2002).

According to Eshiwani (1985), some of the areas that require knowledge of physics include all aspect of engineering, whether mechanical, electrical, civil, and electronic or the new fields of chemical and biological engineering. In profession such as aircraft pilots, locomotive driver and electrical power generations including geothermal, hydro as well as nuclear power generations, or just simple technicians all require applications of physics (Vadya, 2003). Therefore, dropping physics as a subject of study by most students in early secondary school education inhibits the development of these capabilities. This implies that there is need to find out what influences enrolment and retention of student in physics to enable the youth to cope with advancement in technology and to participate fully in industrialization.

2.5 Role of Physics in Industrialization

At the moment, Kenya is gearing up for industrialization by the year 2030 (Republic of Kenya, 2005). According to Zhaoyo (2002), physics play a great role in industrialization. Zhaoyo adds that many aspects of industrialization cannot take place without the knowledge of physics since all structural components of industries are engineering based (Eshiwani, 1985). Technology is the scientific study and use of applied sciences, such as engineering and the application of the same practical

industries (KIE, 2008). Physics is therefore a major requirement for advancement in any engineering course or activity.

It is therefore a concern since while the government is planning for massive use of science and technology to achieve vision 2030 the very people who should be driving the process are shying away from the key subject necessary for industrialization.

From the foregoing, it is evident that physics is useful in almost every aspect of life. If however, most students drop the subject at the earliest opportunity they get, it implies that those students are cut off from a very wide field of employment opportunities. Besides, the need for industrialization by 2030, the country should be producing man power to jump start the process. This is because industrialization is not an event that can be performed at once but rather it is a process for activity that takes time. It is therefore a concern that while the government is planning for massive use of science and technology in a few years to come, the very people who should be driving the process are shying away from the key subject necessary for industrialization (KIE, 2008). This implies that for successful industrialization as projected by the government of Kenya, something has to be done to either reverse the trend or at least stop dropout rate from physics by secondary school students.

2.6 Factors Influencing Students' Choice of Science Subjects

Students' choice of study subjects and their continued retention in them is influenced by various factors which include; childhood experiences, school based experiences and social cultural experiences.

2.6.1 Learning Resources

According to Dekkers (1999) it is possible that student's interests and abilities in different subjects vary according to the type of resources (cultural or economic) that they have both at home and in school. According to Chabari (2010), if physical facilities such as classrooms, library and laboratories are not provided or are not adequate, then curriculum implementation is affected and this may lower the academic performance. Physics being a practical subject, most of the concepts

should be done and investigated by students in the laboratory. The aim of laboratory work is not to demonstrate what has been learnt in lectures, but rather to enable the students to understand the origin of physical laws (Vadya 2003).

According to Njoka (2012), practical in physics involves teachers' demonstrations and class experiments where students perform the experiments. Class experiments are better than teacher demonstration because students develop manipulating skills Wachanga (2005). Contributing further to the issue, Njoka adds that there is significant achievement obtained by students exposed to experiments in physics.

According to KNEC (2000), report physics cannot be adequately taught without exposing students to practical work. It then comes out that school laboratories should be built and equipped adequately if reasonable learning is to take place. Students should be encouraged to make accurate observations. As students get involved in performance of experiments they develop a liking for the subject. Squares (1993) explain that laboratory work serves to; demonstrate theoretical ideas in physics, provide training and experience in doing experiments and provide familiarity with the apparatus used. The 3 purposes are closely linked to a positive attitude formation by the student. It is therefore necessary to provide equipped physics laboratories if students are to develop a liking towards physics.

According to Shiundu and Omulando (1992), the school management should endeavor to provide necessary resources for the support of teaching and learning especially the purchase of relevant textbooks, building and equipping laboratories with correct apparatus and chemicals to facilitate effective learning in the school. School with less provisions, fewer teachers, poor school buildings and inadequate facilities will have a negative influence on the attitudes and academic achievements of the learners.

A study conducted by Yildiz, Akpiner, Aydogdu and Ergn (2006) showed that having no science laboratories or inadequate equipment in science laboratories in schools affect teachers attitudes towards the aims of science experiments in a negative way. Science experiments are inseparable and indispensable parts of

learning experiences. The experiments provide both acquiring science concepts and learning scientific method for learning experiences.

According to NTI (2007), physics as a subject is activity oriented and the suggested method for teaching it is guided discovery method and is resource based.

This suggests that the mastery of physics concept cannot be fully achieved without the use of instructional learning materials. The teaching of physics without learning materials will certainly result to poor performance. According to Bolorunduro (1998), as cited by Alabi (2008) provision of necessary facilities in schools will provide a challenging environment for students to learn and for effective teaching by the teachers.

Olubor (1998) adds that lack of adequate facilities such as textbooks, ill-equipped classrooms; laboratories, workshops and library are among the probable causes of students' poor performance in examinations. Sobdewski and Doran (1996) as cited by Smyth and Hannan (2006) found that teachers experience and instructional facilities have also been found to shape physics take up. Further Smyth and Hannan (2000) indicate that science take up tends to be higher in schools which emphasize practical work and students' participation in classroom activity at both lower and upper secondary levels.

Ubogu (2004) further states that textbooks and workbooks with relevant contents and exercises are required for the learner to get the greatest benefit from his school education. Overuse, misuse or lack of a teaching aid affects the teacher's way of delivery hence affecting the learners' achievement. Text books enable the pupils to follow the teacher's sequence of presentation and aids in understanding of lessons (Ubogu, 2004). Angura (2003) adds that schools with adequate textbooks, apparatus and other instructional materials are at upper hand of performing better. Such materials promote participation and lead to high academic achievement. The schools that lack these materials end up performing poorly in national examinations. Textbooks are often the most cost effective means of improving academic achievement and increasing the efficiency of schools. However some efforts must also be made to ensure that they are adequately used (Angura, 2003).

According to Mbaabu (1993), lack of physical facilities is a problem within the school that head teachers are faced with. Mbaabu (1993) further notes that, in an attempt to get adequate and comfortable physical facilities in their school, head teachers face challenges due to financial constraints and most probably uncooperative stakeholders.

Schneider (2003) in his study carried out in Washington DC, concluded that school facilities have a direct effect on teaching and learning. According to Schneider (2003), poor school participation condition makes it difficult for teachers to deliver an adequate education to their students. This condition adversely affects the teachers and increases the likelihood that teachers will leave their school and the teaching profession. This shows that facilities play a great role in motivating both students and teachers hence translating to good performance.

2.6.2 Teachers Influence on choice of physics

Although research has indicated that students have a larger preference for the knowledge that they can receive from a class rather than the instructor, it is the instructor who has a significant impact on how useful the subject can be (Wilhelm, 2004). Students prefer subjects that are taught by teachers who are enthusiastic, well spoken, knowledgeable, caring, and helpful as opposed to instructors, who are, inflexible, and unclear (Curran and Rosen, 2003). If instructors are inflexible and unclear, they are much more likely to be difficult to learn from, which is a major concern for students (Smith et al., 2006). If students are concerned about a teacher they are less likely to enroll in that class, and vice versa Wilhelm (2004).

During the teaching and learning process, how the material being taught is presented to students determines the level of acquisition of the required concepts and the attitude developed towards the teacher. Waititu (2004) states that the attitude that a student develops towards a discipline like physics can be directly linked to the degree of competence that the presenter (teacher) portrays when presenting it. Here, Waititu (2004) puts the teacher in a position of determining whether the students enjoy learning a given subject (like physics) or not. Mbaabu (2009) adds that when a teacher believes that certain subjects are difficult and

passes on the same attitude to the students, it affects their choice of the subject. Speaking on the influence teachers characteristics have on the student's attitude, Waititu (2004) said that physics teachers are responsible for the extinction the subject is going through, these scholars have shown that the position of a teacher cannot be assumed in a student's attitude towards a given subject like physics.

Teacher preparation and mastery of subject influence effectiveness of teaching. According to Huibregtse and Wubbels (1994) many teachers use pedagogical methods that are similar to those they preferred in their own teachers when they were students or simply teach in the same way they themselves were taught. Further Bell and Gilbert (1994) as cited by Freitas, Jimenez and Mellado (2004) adds that teachers feel satisfied with certain teaching models that have been consolidated by professional experience or because they do not have any teaching strategies readily available that they find better for real daily work of teaching their specific subjects and for the students learning. The teacher is the mediator who transforms content into depictions that are comprehensive to the students.

A study by Kiboss (2002) showed that students conceptions about science might be negatively affected by the way the teacher presents the subject. For example the use of such techniques as lecturing, giving notes and drilling students on past examination papers, which most teachers find as useful strategies, may make pupils perceive science subjects as the mastery of some formulas and or as a way of receiving and storing information. Kiboss (2002) further adds that such techniques eventually makes them lose interest in the subjects.

The knowledge of how teaching and learning approaches affect student learning may help science teachers to select teaching and learning approaches that improve quality, effectiveness and accountability to learners and the public (Wachanga & Mwangi 2004). According to MC Donwell (2001), research on learning no longer supports a transmissive style of lecturing as it has been found that learning through memorization and reproduction does not result in knowledge that can be used to reason and to solve problems in new situations. Thus, the teacher's role is not to lecture in an exclusively transmissive way but to encourage active participation,

dialogue and interaction by student with course materials and with each other. Eshiwani, (1985) noted that teachers should have the knowledge of how student learn science and how best to teach and that effort should be taken now to direct the presentation of science lessons away from the traditional methods to a more student centered approaches.

Given the possible link between science teaching and learning approaches, physics teachers should adopt teaching and learning approaches that can improve students' achievement as the focal point of reversing the current trend of low enrolment of student in physics at KCSE level. Further, teacher student relationship affects the performance of Physics. A study by Brekelmans et al. (1990) found that student perceptions of the teacher influence are related to cognitive outcomes. The higher a teacher was perceived on the influence dimension, the higher the outcomes of students were on a Physics test. Thus, this study was to find out whether and how teachers influence enrolment and retention of students taking physics in secondary schools.

2.6.3 Peers Influence on choice of physics

Young people spend most of their time in sharing out food, playing and talking (Burns, 2002). According to Santrock (2005), peers conformity occurs when individuals adopt the attitudes or behaviors of others because of real or imagined pressure from them. This can be positive or negative on matters relating to acceptance and personal grooming, what to wear, and which place or club to join, both male and female adolescents tend to show a greater reliance on their peers for advice both at home and in school.

According to Muriungi (2012), most of the students in secondary schools are in adolescent stage, a time when their conformity to peer influence is at the peak. Muriungi adds that peer pressure has a positive effect on students learning and selection of optional subject. According to Datta (1992), adolescents seek guidance from their adults and peers. Datta argues further that for one to win the peers acceptance, one must behave according to their standards. Peer group socialization is however unique and this explains why it is very possible for adolescent students to

be influenced by peers in deciding whether or not to undertake a certain field of study (Thomas, 1995). According to a study by Owoyele and Toyobo (2008), students' choice of subjects at school is influenced by jointly peer pressure, parental will and academic ability but it is influenced more by peer pressure and parental will than their academic ability.

Owoyele and Toyobo (2008) further argue that peer pressure has a positive effect on students' subject selection and achievement growth. Further results of a study by Ablard (1997) reported that adolescents enjoy peer support on choice of school subjects and vocational aspirations. Owoyele (2007) found out that peer support has also been found to be positively related to adolescents' academic achievement and choice of school subjects. Datta (1992) reveals that a Nigerian study showed that adolescents tend to seek guidance from anyone available on their study matters who in most cases are their peers. This also explains why peer pressure is very strong among the youth (students). Datta concludes that this was and continues to be a common problem in many countries in Africa. A lot therefore on one's study area or preference depends on whom the adolescents (students) choose as their reference group (Gelles & Levin, 1992). Peer influence is quite strong according to studies; it could make learners to reorder their priorities directions diverged from official goals of these (Sana, 1995). Thus, this study will seek to find out whether and how peers influences enrolment and retention of students taking physics in secondary schools.

2.6.4 Influence of Career Orientations

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 aspiration of occupational options, help them obtain support for their career plans by developing a greater understanding of adolescent's occupational aspirations. Stable career preferences may emerge as early as kindergarten (Trice & king, 1991). Research has shown that interest continue to play a primary role in the selection and rejection of occupations throughout childhood (Trice, Hughes, Odom, Woods, & McChellan, 1995).

A number of external factors have been found to influence adolescents career aspirations, including gender, parental influence, social-economic status, and early school experiences. The role of gender in adolescent occupations has been given much attention (Wahl & Blackhurst, 2000)

McMahon and Patton (1997) found that boys demonstrated a greater awareness of jobs and industry and were more interested in work tasks and work conditions than were girls, who appeared to be more concerned with work environment. Combining career and family life also has been found to be an influencing factor in adolescent girl's career aspirations (McMahon & Patton, 1997). Wahl and Blackhurst (2000) indicated children's career aspirations were more closely related to parental occupations. Among adolescent females in particular, career choice was strongly influenced by the mother's occupation. The mother's occupation was credited because children often attended work with their mothers and were more likely to know what their mothers did for a living. However, a number of studies done in Africa have found that fathers as opposed to mothers do have greater influence on adolescent girls educational and career aspirations.

Semple, Howieson and Paris (2002) found close friendship groups and boyfriends and girlfriends to have considerable influence, mainly in whether aspirations were shared or not, particularly in the case of continued education and training. Friends make supportive or negative comments about certain choices and there is considerable discussion of options within friendship groups. The media has also been found to influence young people's career development without conscious intent (Semple et al. 2002).

According to Owoyele and Toyobo (2008), professional guidance and counseling services are needed to guide students on how to choose subjects based on their academic ability, interest and relevance of such subjects to their future career aspirations. Schools must endeavour to organize academic and career counseling services before such students are asked to select subjects. Subject choices are considered to be significant in determining career paths. Students need information about the structure and content of the science subjects they want to study. This will

help influence their choice of the subject. Research by Igun (2007) and Obayan (2007) in Oriahi, Uhumuavbi and Aguele (2010) showed that students need information about what they are considering providing and understanding of what in particular a discipline involves.

According to Peel (1998) in Aguele (2010) students often receive conflicting advice from parents, teachers, friends and career advisors, and upon entering senior secondary school there can be a mismatch between expectations and actual experiences. The difficulty students may have in obtaining informed advice can influence their choice of science subjects. Studies by Crawley and Black (1990), Lyons (2005), Nahashon (2003), Cleaves (2005), Munro and Elsom (2000), Woolnough and Cameron (1991) show that schools and science teachers have been identified to exert important influences on students decisions about taking physics by providing students with enabling learning environment and career information.

2.6.5 Prior Students Performance in a Subject

Perceived and actual level of difficulty of the subject by the students has been shown to influence the choice of Physics. Tasks perceived by the student as difficulty engender lower expectations for success, perceptions of control and perceptions of self-efficacy than easy tasks. Most learners admit that they consider mathematics and science a difficulty subject. Sharp, Hutchison and Keys (1996) in their survey teachers perceived difficulty as the highest factor that discouraged take up of science followed by negative subject image.

According to Weiner (1992), attributions for past performance influence future performance. Real academic performance is influenced by the importance that students attach to good performance. According to Aduda (2003), students shun physics when given an option and this especially applies to girls. That is given a choice a student would rather drop physics in favour of other science subjects. For a long time physics has been mystified as difficult and hence some schools do not offer it. According to Smyth and Hannan (2006), prior success within science in terms of performance is associated with subsequent take up of scientific subjects.

Further Smyth and Hannan (2006), found out that students are more likely to take science subjects if they find them interesting and useful

Student interest and performance in a learning subject are interrelated. According to Stewart-Strobelt (2003) both absolute and relative levels of ability were relevant to the choice of a subject as it was found that students choose subjects that they are relatively good as compared to other subjects.

Contributing to the issue, Mugendi (2013) argue that even though students are interested in a subject, performance is more significant thus implying that prior achievement is a significant influence on student course choice in school. According to Osborne (2004), students looking forward to university entrance will be strongly motivated by what they perceive to be their best chance of obtaining the required grade. Osborn noted that as students realize that they have to get a certain number of points to go to the university, so often they choose to take subjects that are perceived to be easier.

Students look forward to the opportunity to choose their academic plans and classes (Smith, Feldwisch and bell, (2006). According to the enhanced cognitive engagement theory, allowing students to choose which classes they enroll in increases motivation and independence which in turn increases a student's cognitive processing and performance (Flowerday and Schraw, (2003).

However, the task of subjects is very complex with multiple considerations, most of which overlap with one another. Students are influenced by the different academic portions of the class such as the value of the content, the structure, and the workload. They also have to decide what is important to them with regards to their interests, personal academic goals, and their schedule. But students do not make these decisions alone because they do occasionally seek advice from their family, faculty, and/or friends. Not all of the different considerations of a course are as influential as others, but it is important to know what students want from their classes, what they expect of themselves, and who they will listen to. Educators and schools need to know this information; especially those of elective courses so they can meet the needs of students and have them continue to enroll

in their class.

More importantly though, if teachers can adapt their classes to better meet the needs of students the students will be more engaged which will increase their comprehension and excitement for the curriculum, which should be any teacher's ultimate goal (Flowerday & Schraw, (2003):.. Hence, this study sought for the influence of previous students' performance in physics as a subject on enrolment and retention of students in physics classes in secondary schools in Kenya.

2.6.6 School Policy

Whether or not a subject is provided in a school is clearly a matter of policy for that particular school. School organization may facilitate or constrain the choice of physics. According to Smyth and Hannan (2006), schools are found to make assumptions about the abilities and needs of their student intake, assumptions which guide their decisions about which courses to offer. Muli (2012) found that schools can influence course up-take indirectly through restricting choice of some optional subjects and more subtle encouragement of the take-up of particular types of subjects. Aduda (2003) asserts that despite the fact that physics is an important subject in economic, scientific and technological development most schools have made it optional in form three and four and others do not offer it at all. According to Smyth and Hannan (2006), schools vary in the way in which scientific subjects are made available within the school; they may allow certain ability groups to take particular subjects or they may set prerequisite for taking certain subjects. At upper secondary levels, schools vary in the way in which scientific subjects are made available within the school and this affect the take up of physics.

2.6.7 Early Childhood Experiences

Biographical studies of Albert Einstein, Robert Burns, Woodward, Charles Darwin, Richard Feynman and other eminent scientists suggest that rich and playful early childhood experiences with science had an impact on their careers and interest in science (Kegan, 1989; Shepard, 1988; Rothenberg, 2005; Tweney, 1989; Woodward, 1989). Their interests were: playing with physical gadgets, playing with mechanical construction sets, working with electricity, and enjoying experiments

that included “messing around.” Rowsey (1997) examined the influence of schooling on the vocational choice of university professors from various fields of science and ascertained that elementary and middle school teachers had little influence on vocational choice by university professors. Most of the professors were influenced by parents and other relatives in their career choice and said there was not any particularly influential event in junior or senior high school that impacted their choice to become scientists. Research indicates that playful engagement with science in childhood and youth influences interest in science.

Joyce and Farenga (1999) examined the science perceptions of high ability upper elementary students and ascertained that they had already decided whether they liked or disliked science before the age of nine. These students believed that their early childhood science experiences inside and outside of school played a key role in development of their interest. Research with a cross-section of adults, as well as research with science majors, confirms the importance of early experiences in the development of interest in science. Falk (2002) surveyed adults over 18 years old on the contribution of non-school sources for learning science and found that science was not exclusively nor even primarily learned in school.

The survey results revealed that a significant percentage of science learning occurs from the following, in order of significance: books and magazines (not for school), life experiences, TV and cable, school science courses, museums and zoos, on the job, family and friends, radio and audio tapes . In a study with undergraduate in a geology research program, Jarret and Burnley (2005) found that outdoor explorations such as collections, museum visit, LEGO bricks and other construction toys were important aspects of their childhood experiences. These experiences appeared to be influential for geology undergraduates’ interest in science and choice of science as a career. Three studies using the Relevance of Science Education (ROSE) survey (Kim & Song, 2009; Lavonen, Byman, Uitto, Juuti & Meisalo, 2008; Trumper, 2006) also suggest a connection between background experiences and personal interest in science.

In Finland, experiences with science and technology hobby activities predicted interest in how things work and science and technology in everyday life (Lavonen, et al., 2008). In the same study, experiences of nature and making collections predicted interest in astronomy and cosmology, environmental issues, human phenomena, and physics and chemistry in the environment. Surveying students in Japan, Kim and Song (2009) found that interest in science is associated with intrinsic attitudes and experiences rather than stemming from the importance of science for society. De Laat and Watters (1995) studied the origins and changes in preservice teachers' science teaching self-efficacy and found that teachers with high personal teaching self-efficacy had been interested in science for a long time and had a relatively strong background of formal and informal science experiences. A study of preservice elementary teachers (Sampson, 1992) examined their previous school and life experiences and attitudes toward science and science teaching. Most of the preservice teachers in the study claimed that their non-school experiences stimulated their curiosity more than their science classes in school.

The amount of learning in the science classroom has been found to relate positively to the initial interest and attitudes, that child will bring into the classroom. Duncan (1989) reported that social background, aptitude, socializing experiences, home activities, gender roles, ideology, views concerning the role of science subject and the stereotyping of science subject and occupation together give rise to specific science related beliefs and attitudes. One's belief on an object determines the attitude; belief on the perceived easiness (or difficulty) of science has been found to determine attitude towards science and science achievement (Duncan, 1989). Generally a positive attitude among the students is an important goal of science education in many jurisdictions (Mayer, Mullen & Moore, 2000). An examination of the major goal of education reveals unity of opinion that the development of scientific literacy includes development of positive attitude towards science (Lederman, 1994; Linn, 1992). This development of positive attitude towards science is a critical component of science instruction (Gardner, 1991).

George and Taylor (2001), Hoffman (2002), Munro and Elsom (2003) found that students' early science learning experiences and perceptions of school science were

influential in students physics enrolment decisions. Further, according to George and Taylor (2001), students who enjoyed their learning experience in junior secondary and achieved good results in science were found to be more confident in their abilities and more likely to enroll in physics. It is judged imperative that student develop favourable attitudes at an early age and this favourable orientation should be maintained (Anderman & Maehr, 1994). Tuaundu (2009) revealed that there should be a strong bond between Physics contents and students everyday experiences. This implies that students who are exposed to technological toys and games will have greater interest in physics because of the existing knowledge that they have. This knowledge plays an important role in the understanding concepts in physics. This study was to find the influence of early childhood experiences on enrolment and retention of students in physics classes.

2.6.8 Gender Stereotyping and Cultural Practices

Social persuasion refers to judgment, feedback and support of students, with teachers and with their parents. All these interventions determine the belief of the learner on their capability to accomplish a task and are being perceived to be genuine. Gender is the entire set of differences attributed to males and females which vary across culture; social interpretations of what it means to be a man or a woman. Gender is the significance a society attaches to the biological categories of female and male in regard to the attitudes and activities that a society links to each sex (stark, 2004). Bussy and Bandura (2003) define gender as the Psychological, social and cultural differences between males and females; is not biologically determined but culturally produced. Gender is the personal trait and social position that members of a society attach to being a female and male (Macionis, 2002). Macionis stresses further that gender is a dimension of social organization, shaping how people interact with others and even how they think about themselves. Archer and Cressy (2000) found that gender involves hierarchy, placing men and women in different positions in terms of power, wealth and other resources. Archer and Cressy (2000) adds that global comparisons show that by and large, societies vary widely in defining tasks as either feminine or masculine.

Both sexes are physically capable of learning to cook and sew yet most western societies determine that women are capable of learning to weld and fly airplanes but these functions are generally assigned to men (Schaefer, 2003). Wayne (2004) refers to gender as social interpretations of what it means to be a man or woman. Wayne further, explains that males and females are understood by the culture to have different attributes and to be suited for different social roles. Tillie (2007) maintains that women's career choices are often determined by powerful social and cultural forces that shape her decisions in accordance with frequent false assumptions in regard to women's needs, abilities and aspirations. Tillie points out that the women at the top of the career spectrum are faced with the pressures to conform to traditional stereotypes as well as those pursuing career paths that require less education and training are just as much the victim of societal attitudes that may cause them to accept less than fulfilling position. Bussey (1995) says that men are more aggressive and women are nurturing because pre-historic females were more likely to be care givers.

In the world of careers women fit best in careers that demand nurturing, empathy while average men fit best in careers that demand aggression (Inkule, 2004). This implies that while choosing subjects that will lead to future careers, secondary school students require knowing whether or not their gender can be used to determine their career choices.

Social cognitive development is assumed to be greatly influenced by the learners' history of reinforcement and social learning and their categorization as a boy or girl. The sex typed behaviours of learners is increased by gender labeling which could further be enhanced by the parents early gender labeling. This is indicated by the parents providing sex typed toys. The use of gender categories by teachers during teaching also enhances gender stereotypes (Olson & Dweck, 2008). The onset of gender self-labeling also enhances gender stereotypes. This occurs as the learners identify and realize themselves as a boy or girls. This takes place over time and consequently brings out the learner mental representation (Bussey & Bandura 1999).

Boys and girls are exposed to many influences regarding gender roles and tend to adopt gender-stereotyped behaviours and attitudes which are initially passed on from parents to children during the early years in the home. These gender stereotypes are reinforced as the children grow and develop and differences between boys and girls appear during early childhood as part of the social creation and embodiment of the “self” (Martin *et al.*, 1990; Etzkowitz *et al.*, 2000). Initially, the shaping of self-concept is influenced by those who are close (i.e. immediate family) to the child; gradually, during adolescence, other influences such as peers, role models and cultural norms tend to recast gender differences into gender stereotypes. The child thus may fearfully avoid what is considered as socially unacceptable and tries to conform to stereotypical social roles (Eccles *et al.*, 1990).

Gender differences seem principally, or even entirely, to be the result of social factors due to the socialization experiences of males and females for both sexes. The gender specificity of identity development has been further emphasized by Duveen (2000); boys and girls tend to develop different ways of responding to the world and making sense of it.

Girls from a very young age take part in activities which are creative such as drawing, reading or talking whereas boys are generally observed to be more constructional and involved in technical tasks (Murphy, 1997, 2002). By taking part in activities which are characteristic of their sex, pupils develop gendered ways of being in the world (Murphy, 2000). Societal factors, childhood socialization, the learning environment in the science classroom and altruistic reasons for choosing science have been reported to develop gendered identities (Baker & Leary, 2003).

Parents provide their children with cultural capital by transmitting to them the knowledge and attitudes needed to succeed in the education system (Bourdieu & Passeron, 1990). Parents play a crucial role in the creation of sex-differentiated values and self-perceptions. Though these effects may not be intentional, parents, perhaps unconsciously, promote gender-specific beliefs and behaviours which discourage their daughters from studying science, mathematics and other science related subjects. Andre *et al.* (1999), in their study on competency beliefs, positive effect and gender stereotypes of elementary students about science versus other

school subjects, showed that parents perceived science as more important for boys than girls and expected boys to do better in science. They suggest that attitudes and beliefs about gender differences in science tend to start by the earliest elementary school years.

Normally girls are treated differently from boys from an early age by their parents; boys are encouraged by parents to be more adventurous and forceful and are more likely to have hobbies and interests dealing with electrical and mechanical devices; they may be asked to help their father doing technical tasks in the house and garden and use tools such as electric drills, saws and hammers. Girls, by contrast, are more likely to be asked to play with soft toys or to help their mother with housework and not to involve themselves in dangerous activities which could hurt them. Such interests, hobbies and behaviour could be linked to boys preference for the physical sciences (Dawson, 2000).

Many experiments in science involve equipment and tools which are unfamiliar to girls. Boys, therefore, get a better chance to process scientific knowledge in schools. Family background, such as having a relative who is in the engineering or scientific field, has been found to be another predictor of whether girls choose science or engineering career (Breakwell, 1992; Gogolina & Swartz, 1992; Dalgety & Coll, 2004). These researchers noted that having a mother or a father who strongly supported science was a predictor for greater involving in scientific activities and development of positive attitudes to science by pupils. Nevertheless, it has been found that parental influence for the study of science tends to decline as boys and girls grow up and relationships with teachers and other role models become more important (Johnston & Spelepeng, 2001; Jarvis & Pell, 2002).

Science subjects are often presented in a way that is seen as dispassionate, objective and of little or no relevance to the lives of girls and women so that they are put off by science, especially the physical sciences. The frequent depiction of males as associated with the physical sciences, for example the frequent association of advances in the physical sciences with men and the naming of units, laws, constants,

hypotheses, equations and experiments after male scientists, gives science a male bias (Harding & Parker, 1995).

Gender stereotyping perceptions of selected science courses have also been identified by Farenga and Joyce (1999) who, in their study of course preferences of young students between the ages of 9 to 13 in the USA, reported a strong gender effect where both boys and girls perceived physical science and technology-related courses as appropriate subjects for boys to study and life sciences as appropriate subjects for girls to study. The diminishing interest of girls in physics has been linked to the growing acceptance of their gender role. For example, there are topics which girls find attractive which Hoffmann and Haussler (2002) identify. They state that girls interest in physics could be promoted if topics such as weather, rainbows, eclipses of the moon, astronomy, optics and presentation of physics in a biological or medical context were integrated into the physics curriculum. Girls would respond better to the physical sciences if scientific knowledge was more closely linked to their direct personal experiences and societal issues rather than to technical apparatus, engines and war materials. In their intervention study Hoffman and Haussler made use of measures in physics which adapted the curriculum to the interests of girls but which proved advantageous to boys too during a period of a whole year. Other additional measures involved improving the ability of teachers to provide girls with an opportunity to improve their self-concept about physics.

According to Vygotsky social cognitive development learning model, culture is the prime determinant of individual's development. Every human child develops in the context of culture. Thus a child learning development is affected by parents strong gender role stereotyped belief. According to Mugendi 2013, before a girl begins to learn, parents' do not expect much of them in physics field and they even do not think it of much importance to them. This interferes with the girl's attitude towards physics. Mugendi further adds that physics knowledge is masculine and the school curriculum exaggerates this masculinity. This results from the different emotional characteristics and cognitive styles that develop in girl and boy due to their nurturance and the fact that the physics curriculum matches exclusively the needs of

boys (Rennie, Parker & Harding, 2004). Schools propagate a masculine image of physics.

This is due to the disproportionately large number of male who study and teach physics. This content too includes illustrations, examples and applications which are more familiar to experiences and interest of males as opposed to females. This context typically omits reference to women and social aspects of physics which would be of interest to girls (Murphy & Whitelegg 2006). In Kenya the Ministry of Education (2011) noted that most factors influencing choice of subjects may be universal in all regions but some unique factors cannot be ruled out. For instance, Ministry of Planning and National Development (2002) reported that in Kisumu District, gender inequality is deeply rooted on cultural and traditional values which prescribed roles based on sex is a common phenomenon. Many girls in the district are encouraged to do what they believe is feminine jobs like teaching, secretarial but not engineering or architecture which is known for men. Hence, the effect of social-cultural experience was investigated in this study to determine their influence on the enrolment and retention of students' in physics classes.

2.9 Theoretical Framework

The study was guided by Atkinson (1964) achievement motivation theory. According to this theory, achievement is associated with past task engagements over a time. For individuals with a subjective history of success, a past achievement elicits a feeling of pride. This achievement pride produces anticipatory goal reactions that energize and direct behaviour to approach the new task. For individuals with a subjective history of failure, on the other hand, a new task elicits a feeling of shame. This achievement shame produces anticipatory goal reactions that energize and direct behaviour to avoid the new task.

According to De cecco (1968), motivation refers to those factors which increase and decrease the vigor of an individual's activity and achievement motivation as the expectancy of finding satisfaction in mastering challenging and difficult performances. There is a strong correlation between motivation to learn and student achievement. One reason why some students try harder than others is because they

differ in achievement motivation, that is, their willingness to strive to succeed at challenging tasks and to meet high standards of achievements. According to Atkinson and Feather (1966), a central conflict facing children is the drive to succeed and the urge to avoid failure. To work out this conflict, children evaluate whether or not they expect to succeed in a task up against the premium placed on either success or failure. In this kind of a situation students make choices.

Brophy (1987) states that motivation to learn is a competence acquired through experience but immediately encouraged through modeling, statement of expectations and instruction by significant others. To this end what takes place in the classroom, school setting and at home is critical to student success. What is taught and how it is taught exert tremendous influence on the students' motivation to learn. With that in mind, teachers and parents are heavily weighted variables in the equation of motivation. According to De cecco (1968) the teacher must help the student who lacks the desire to achieve to acquire the desire or the motive. Repeated success will build confidence and the urge to move on and discover more but repeated failure kills the morale to proceed especially where the student lacks support of the colleague, teacher, and even the parent. Covington (1984) found that children who consistently do poorly in school tend to believe that they are not academically capable as other children. These motivational characteristics could be shaped by the parent, teachers and learners themselves. In other words the researcher is being informed that teachers', fellow students' and parents' influence on a learner during the daily learning interactions can determine whether the learner will understand and master concepts and like the subject and consequently decide to pursue it to higher levels or not.

This framework informs the current study in that it stipulates the importance of manipulating the independent variables to improve the enrolment and retention of students in physics. The manipulable variables which are the independent variables include the school based, early childhood and social cultural experiences. It is possible to predict and influence students' enrolment and retention in physics through manipulating the variables in the students learning environment. Thus the enrolment and retention of students in physics is a function of the manipulation of

the students' experiences in and out of school. The experiences that the students are exposed to are very crucial because with a favorable physics learning environment we alter the function and more students are bound to enroll and choose physics. However, in an environment that is not favorable few students enroll and choose physics.

2.10 Conceptual Framework

Enrolment and retention of students in physics in secondary schools is as a result of interactions of students, teachers and resources available in a learning institution. A conceptual framework is a diagrammatic representation showing interaction between independent and dependent variable.

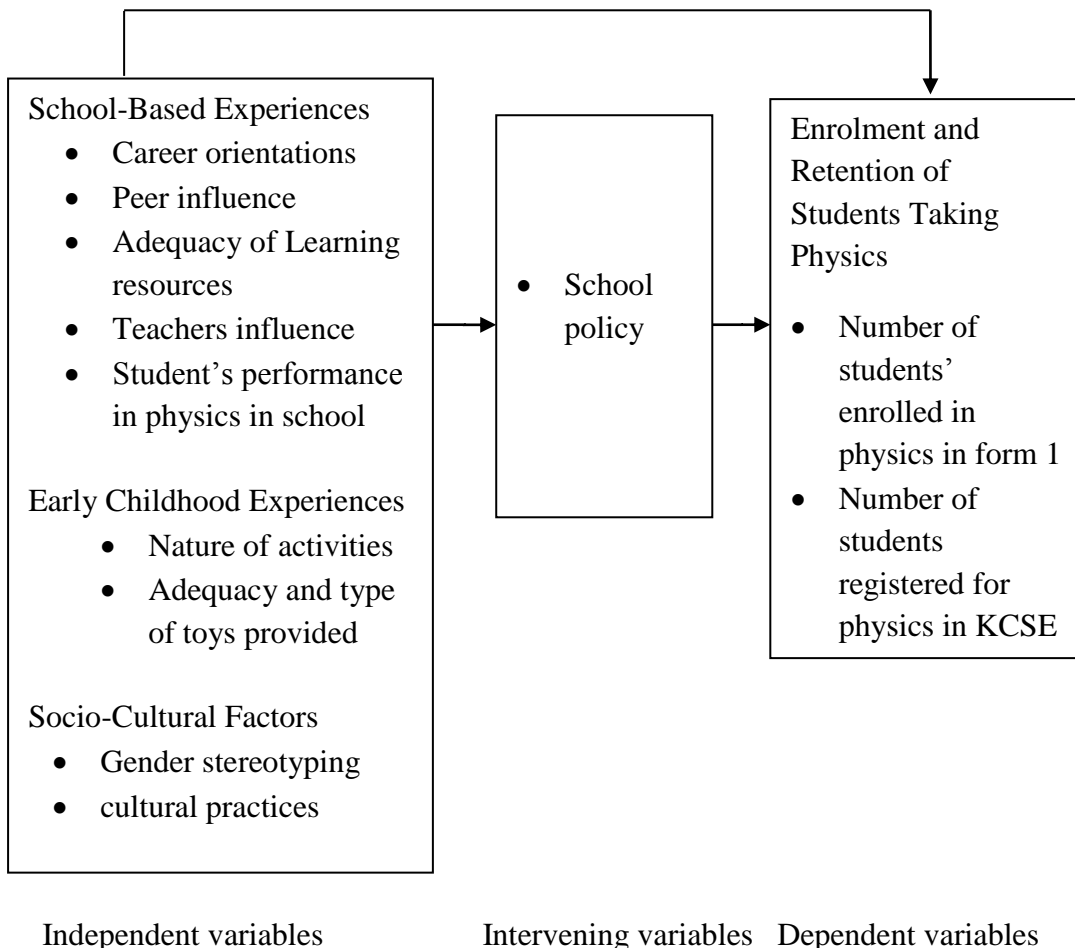


Figure 1. Factors Influencing Enrolment and Retention of Students in Physics

The independent variable is variable that a researcher can manipulate in order to determine its effect or influence on another variable. The independent variables in this study were early childhood experiences, school based experiences, and social-cultural experiences. The dependent variable attempts to show the total influence resulting from effects of the independent variable. Example of the dependent variables in this study is the enrolment and retention of students in physics. Intervening variables are those factors which have influence on both the independent and dependent variables such as the teaching methods in this study. The independent, dependent and intervening variables have influence on the learning of physics as they lead to either student continuing or dropping the subject in form three. Selection of physics as study subject or dropping at form three is a clear manifestation of these interactions. The study sought for the influence of selected factors listed on figure 1 on enrolment and retention of students taking physics in secondary schools.

CHAPTER THREE METHODOLOGY

3.1 Introduction

This chapter constitutes description of the research design, location of the study, population, sampling procedures and sample size. It also presents information on instrumentation, validity and reliability of instruments, data collection procedures and data analysis.

3.2 Research Design

The researcher used the descriptive survey research design. This design was adopted because it gives accurate description of variables. According to Gay (1992), this research design allows the researcher to gather the information, summarize and interpret the data and assists in obtaining pertinent information concerning the phenomena and whenever possible draw general conclusions from facts discovered. Orodho (2003) defines descriptive survey as a method of collecting information by interviewing or administering questionnaires to a sample of individuals. According to Ng'ong'ah (2002) descriptive survey research design is a design in which the researcher attempts to collect data from members of a population and explores the existing status of two or more variables at a given point in time. The researcher collected information from respondents concerning the factors influencing students' enrolment and retention in physics in secondary schools without manipulation of variables making the design appropriate for the study.

3.3 Study Location

The study was carried out in secondary schools of Imenti South Sub-County in Meru County, Kenya due to their easy accessibility. According to Singleton (1993), an ideal location of any study should be easily accessible to the researcher and should be that which permits instant rapport with the informants.

3.4 Study Population

The target population in this study was 14,097 subjects comprising of 13,943 students and 154 physics teachers in 70 secondary schools in Imenti South Sub-County (Sub-County Education Office, 2013). The accessible population in this study was 7098 Form Two and Three students and 154 physics teachers in the Sub-County.

3.5 Sampling Procedure and Sample Size

According to Wiersman (1995) a sample size is a small proportion of a target population selected for study. Kathuri and Pals (1993) recommends a sample size of 364 respondents for a population of 7000 subjects. Stratified sampling method was used to select schools to be included in this study. Stratified sampling ensures proportionate representation of subgroups in the sample (Nkapa, 1997. Out of 70 secondary schools in Imenti South Sub-County, 14 were sampled. This number is the minimum recommended by Mugenda and Mugenda (1999) in that for a population less than 1000, 20% of the accessible population should be picked as a sample.

Simple random sampling technique was used to select 8 physics teachers from the sampled secondary schools. Simple random sampling was used to sample 49 form three and form two students from each selected sub-county boarding secondary schools and 12 form two and form three students from each selected sub-county day secondary school. A total of 8 teachers and 356 students' gave a total of 364 respondents as a sample. This sample of 364 respondents is above the minimum of 100 respondents recommended by Borg and Gall (1995) for a population in a survey study.

Table 3
Sampling Grid for Students and Physics Teachers

School Type	No. of Schools	School Sample Size	Number of Students	Students Sample Size	No of Physics Teachers	Teachers Sample Size
Sub-County Boarding Secondary	23	5	4209	246	51	3
Sub-County Day Secondary	47	9	2196	110	103	5
Total	70	14	7098	356	154	8

Source: District Education Office; Imenti South Sub-County (2014)

3.6 Research Instrument

The researcher used questionnaires to collect data.

3.6 Questionnaires

The study adopted questionnaire as a tool for data collection for physics teachers and students. Kombo and Tromp (2006) points out that questionnaires are less expensive, do not consume a lot of time in their administrations and allow the respondents freedom to bring out their views and feelings independently and hence there is no opportunity for interviewer bias. A questionnaire offers a considerable advantage in the administration, provides the investigation with an easy accumulation of data, gives respondents freedom to express their views or opinion and ensures confidentiality by being anonymous (Mugenda & Mugenda, 1999). The study used three sets of questionnaires for the physics teachers, form two students and form three students. The questionnaires were divided into four sections: section A sought for information on demographic data, section B sought for information on school based experiences, section C sought for information on early childhood experiences and Section D sought for information on socio-cultural experiences.

3.7 Piloting

A pilot study allows for pre-testing of the research instrument to determine whether the questionnaires' items possess the desired qualities of measurement and to identify and correct any deficiency in the instrument. According to Mugenda and Mugenda (2003) pilot study gives advance warning about where the main research project could fail, where research protocols may not be followed or whether proposed methods or instruments are inappropriate or too complicated. Before the actual data was collected, piloting was done in three secondary schools in the neighbouring Imenti North Sub-County. Mugenda and Mugenda (1999) purports that the questionnaire should be pretested to a selected sample which is similar to the actual sample which the researcher plans to use in the study and that those subjects in the actual sample should not be used in the pre-test. The reasons behind the pretesting was to assess the clarity of the questionnaire items so that those items found to be inadequate or vague were to be discarded or modified to improve the quality of the research instruments thus increasing reliability. According to Borg and Gall (1995) a pilot study should include more than 20 subjects. Hence, 4 physics

teachers and 42 form two and three students (14 from each school) were involved, thus making a total of 48 cases.

3.7.1 Reliability

According to Mugenda and Mugenda (1999) reliability of a research instrument is the measure of the degree to which a research instrument yields consistent results after repeated trials. Reliability was assessed through the split-half technique. The pilot questionnaires were divided into two equivalent halves and subject scores from the odd numbered questions were correlated with those of the even numbered questions of the questionnaire. Spearman Brown Prophecy Formulae was used and correlation coefficient of 0.851 and 0.957 for the students and teachers questionnaire respectively was obtained. According to Gay (1992) a correlation coefficient of 0.7 for the two halves is considered sufficient for the instruments to be considered to be reliable. The questionnaires were therefore deemed to be reliable for use with the population.

3.7.2 Validity

Validity refers to the degree to which a test measures what it purports to measure (Borg & Gall, 1995). The researcher sought assistance of the experts, who helped to ensure construct and content validity of the instrument. This was to ensure that the questions provide adequate coverage of the topic under study.

3.8 Data Collection Procedure

The researcher sought clearance from Chuka University ethics committee and then applied for a research permit from the National Commission for Science, Technology and Innovation (NACOSTI). The researcher visited Imenti South Sub-county Education Office and sought further authority to collect data. Data was collected through questionnaires comprising of closed and open-ended items. The researcher visited the sampled schools to establish rapport with the administration and for commencement of data collection exercise. The researcher liaised with physics teachers in all the schools under study to identify all the students involved. The researcher then administered the questionnaire after issuing clear instructions on how to answer the questions and collected them after a week later to ensure minimal interruption of the school programme.

3.9 Ethical Issues

All the respondents were assured of confidentiality on whatever they wrote in the questionnaire and that their identity was not to be revealed. The respondents did not indicate their names or provide any form of identity on the questionnaire. The researcher assured the respondents that the information provided in the questionnaire was to be used for academic purposes only. To avoid disruption of the learning process in schools, administration of questionnaires was done outside lesson hours for both students and teachers. With the help of the physics teachers in the sampled schools, the researcher administered the questionnaires to the respondents. The respondents were given enough time to respond to the questions and the researcher thereafter collected the completed questionnaires.

3.10 Data Analyses Procedure

Data analysis started with data cleaning which involved identifying incomplete responses. Data was then coded by assigning a code number to each answer in the question. Coded data was then transferred to a computer sheet prepared using the Statistical Package for Social Science (SPSS). Qualitative data was analysed using thematic approach while quantitative was analysed using percentages and frequencies. The results of the data analysis were then presented in frequency tables, bar graphs and charts.

The summary of data analysis techniques is shown in Table 4.

Table 4
Methods of Data Analysis

Research Questions	Independent Variables	Dependent Variable	Method of Data Analysis
i) What are the school-based experiences that influence enrolment and retention of students in physics in secondary schools in Imenti south sub-county?	School based experiences	Enrolments and retention of students	Frequencies/percentages
ii) What are the early childhood experiences that influence enrolment and retention of students in physics in secondary schools in Imenti south sub-county?	Early childhood experiences	Enrolments and retention of students	Frequencies/percentages
iii) What are the socio-cultural experiences that influence enrolment and retention of students in physics in secondary schools in Imenti south sub-county?	Social cultural experiences	Enrolments and retention of students	Frequencies/percentages

CHAPTER FOUR RESULTS AND DISCUSSIONS

4.1 Introduction

In this chapter results of data analysis on factors influencing enrolment and retention of students in physics in secondary schools in Imenti South Sub-county in Meru County are presented in tables and figures. The demographic characteristics of the respondents who participated in the study are presented followed by the data analysis as per the research objectives.

4.2 Demographic Information of the Respondents

The researcher collected data from form two and form three students and physics teachers for the study. Demographic data sought from the students included gender, the highest level of education of their parents while the teacher's questionnaires sought demographic data on gender, professional training and teaching experience in physics. The findings obtained are illustrated in Table 5.

Table 5

Distribution of Respondents by Gender

Respondents	Gender	Frequency	Percentage (%)
Students	Male	165	44.4
	Female	207	55.6
Teachers	Male	6	75
	Female	2	25

According to the results in Table 5, 55.6% of the students who participated in the study were female while 44.4% were males. In addition, 75% of the teachers who participated in the study were male while 25% were female. The results of the study therefore suggest that the schools sampled for the study had more male physics teachers as compared to female teachers.

The study sought information on the highest education level of the parents of the students in secondary schools in Imenti South Sub-county and the results are as shown in Table 6.

Table 6

Level of Education of Students' Parents

	Fathers education level		Mothers education level	
	Frequency	Percentage	Frequency	Percentage
University	78	21.0	81	21.8
Diploma	21	5.3	30	8.1
Certificate	84	22.6	47	12.6
Form 4 / 6	90	24.2	76	20.4
Below form 4	99	26.6	138	37.1
Total	372	100	372	100

According to the information in Table 6, 26.6 % of the students' fathers and 37.1% of students' mothers had not attained education above form four.

The study sought information on the teaching experience of the physics teachers in Imenti South Sub-county. The findings obtained are illustrated in the Table 7.

Table 7

Teaching experience of physics teachers

Teaching Experience	Frequency	Percent
less than 2 years	1	12.5
2-5 years	4	50.0
5 - and above	3	37.5
Total	8	100.0

The results in Table 7 established that 50.0% of the teachers had 2 to 5 years of experience in teaching physics and 37.5% of the teachers had taught physics for over five years.

4.3 School-Based Experiences and Enrolment and Retention of Students in Physics

The researcher sought information on school policy of choosing three sciences from the students. The results are as shown in Table 8.

Table 8

Students Opinion on school Policy of Choosing Three Sciences

Category	Frequency	Percent
Students are free to take all the three sciences	29	7.8
Students are allowed to freely choose 2 sciences	68	18.3
Chemistry or biology is compulsory , choice is between physics and biology or physics and chemistry	275	73.9
Total	372	100.0

According to the information in Table 8, 7.8% of the students indicated that students are free to take all the three sciences, 18.3% of the students indicated that students are allowed to freely choose 2 sciences and 73.9% of the students indicated that chemistry or biology is compulsory; choice is between physics and biology or physics and chemistry. From the findings chemistry or biology is compulsory in most of the schools and students are restricted to choose between physics and biology or physics and chemistry

The researcher sought information from students on the influence of school policy of choosing three science subjects on their enrolment and retention in physics. The results are as shown in Table 9.

Table 9

Students Opinion on Influence of School Policy of Choosing Three Science Subjects

Category	Frequency	Percent
Very great extent	236	63.4
Great extent	123	33.1
Small extent	13	3.5
Total	372	100.0

According to the results in Table 9, 63.4% of the students indicated that school policy on choice of science subjects influence their enrolment and retention in physics to a very great extent while 33.1% and 3.5% of the students felt that school

policy on choice of science subjects influence their enrolment and retention in physics to a great extent and small extent respectively.

The researcher sought information from teachers on the influence of school policy of choosing three science subjects on enrolment and retention of students in physics.

The results are as shown in Table 10.

Table 10
Teachers Opinion on Influence of School Policy of Choosing Three Sciences

Category	Frequency	Percent
Very great extent	4	50.0
Great extent	3	37.5
Small extent	1	12.5
Total	8	100.0

According to the information in Table 10, 50% of the teachers indicated that school policy on choice of science subject influence enrolment and retention of students in physics to a very great extent while 37.5% and 12.5% of the teachers felt that school policy on choice of science subject influence enrolment and retention of students in physics to a great extent and small extent respectively. From the findings most of the teachers felt that school policy on choice of science subject influence enrolment and retention in physics. From the findings of the study, schools in Imenti south sub-county offer all the three sciences in line with the guide lines from the ministry of education but most of the schools restrict the choice of science subjects to be studied. Therefore it can be concluded that school policy on choice of subjects influence students choice of Physics in Imenti south sub- county.

The findings of the study agree with those of a study by Muli (2012) on factors influencing choice in physics in public secondary schools in Kangundo sub county which indicated that schools can influence course up-take indirectly through constrain and encouragement of the take-up of particular types of subjects.

The study sought the opinion from the students on whether career guidance influences their enrolment and retention in physics. The results are as shown in Table 11.

Table 11
Influence of Career Guidance to the Choice of Physics

	Frequency	Percent
Very great extent	6	1.6
Great extent	16	4.3
Small extent	15	4.0
No extent	335	90.1
Total	372	100

Results in Table 11 indicate that 90.1% of the respondents were not influenced by career guidance while 4.3% and 4.0% of the respondents felt that career guidance influenced their choice of physics to a great extent and to a small extent respectively.

The study sought the opinion from the teachers on whether career guidance influence enrolment and retention of students in physics. The results are as shown in Table 12.

Table 12
Influence of Career Guidance to the Choice of Physics

	Frequency	Percent
Small extent	1	12.5
No extent	7	87.5
Total	8	100

According to the results in Table 12, 87.5% of the respondents indicated that career guidance does not influence students' enrolment and retention in physics while 12.5% of the respondents felt that career guidance influence students enrolment and retention in physics to a small extent.

From the findings of the study most of the students in Imenti Sub County were guided on choice of career before they chose their science subjects. It can be concluded that lack of guidance on career choice did not affect choice of physics.

The study sought information from the students regarding influence of adequacy of physics apparatus on their enrolment and retention in physics. The results are as shown in Table 13.

Table 13
Students Opinion on Influence of Adequacy of physics Apparatus

	Frequency	Percent
Very great extent	96	25.8
Great extent	203	54.6
Small extent	67	18.0
Undecided	6	1.6
Total	372	100

According to the results in Table 13, 25.8% and 54.6% of the students indicated that adequacy of teaching apparatus influence their enrolment and retention in physics to a very great extent and great extent respectively while 18% of the students indicated that adequacy of teaching apparatus influence their enrolment and retention in physics to small extent.

The study sought information from the teachers regarding influence of adequacy of physics apparatus on enrolment and retention of students in physics. The results are as shown in Figure 2.

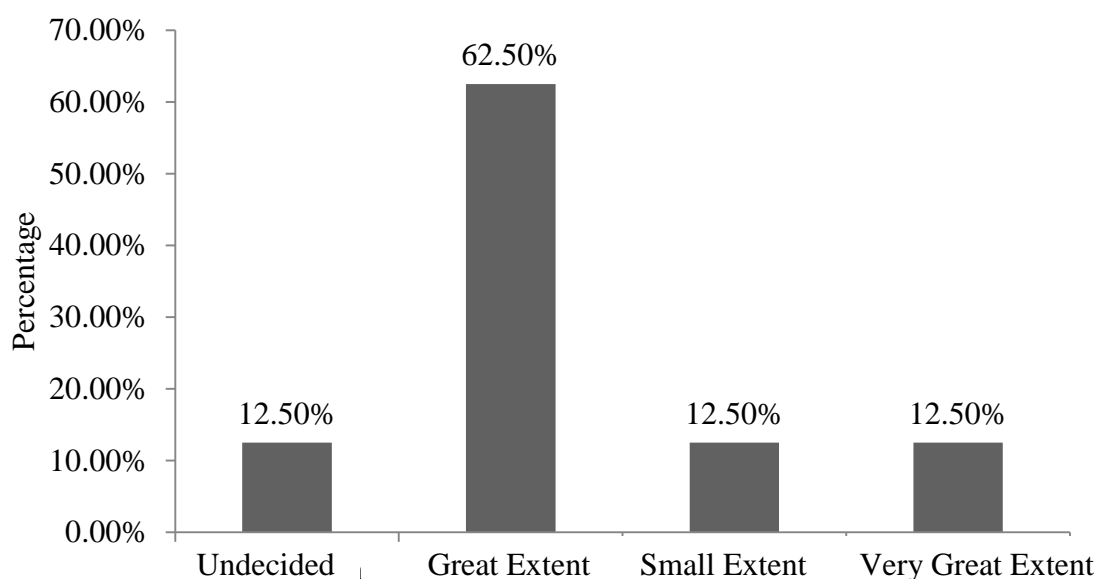


Figure 2. Teachers Opinion on the influence of Adequacy of Physics Apparatus

According to the information in Figure 2, 62.5% of the teachers indicated that adequacy of teaching apparatus influence enrolment and choice of physics to a great extent while 12.5 % and 12.5% of the teachers indicated that adequacy of teaching apparatus influence enrolment and choice of physics to a very great extent and small extent respectively.

According to KNEC (2000) report, physics cannot be adequately taught without exposing students to practical work. Njoka (2012) adds that there is significant achievement obtained by students exposed to experiments in physics. This suggests that teaching of Physics without adequate apparatus results to poor performance. The study suggest that adequacy of apparatus influence enrolment and retention of students in physics. The findings agree with Smyth and Hannan (2000) that science take up tends to be higher in schools which emphasize practical work and students' participation in classroom activity at both lower and upper secondary levels.

The study sought information from form two students to find out reasons students had for willing to choose physics. The results are as shown Table 14.

Table 14
Reasons Students had for Willing to Choose Physics

	Frequency	Percent
Performance in physics is good	32	54.2
Future career require physics	7	11.9
Adequacy of learning resources in physics	13	22.0
Encouragement by friends	4	6.8
Encouragement by physics teacher	3	5.1
Total	59	100.0

According to the result in Table14, 54.2 % of the students indicated that good performance in physics will make them to choose physics, 11.9 % of the students indicated that future careers needs will make them to choose physics, 22.0 % of the students indicated that adequate learning resources in physics will make them to choose physics, 6.8% of the students indicated that encouragement by friends influence them while 5.1 % indicate that encouragement by physics teachers will make them choose physics

The study sought information from form two students to find out reasons students had for declining to choose physics. The results are as shown Table 15.

Table 15
Reasons Students had for declining to Choose Physics

	Frequency	Percent
Performance in physics is poor	87	68.5
Future career doesn't require physics	13	10.2
Inadequacy of learning resources in physics	19	15.0
Discouragement by friends	6	4.7
Discouragement by physics teacher	2	1.6
Total	127	100.0

According to the information in Table15, 68.5 % of the students indicated that poor performance in physics will make them not to choose physics, 10.2% of the students indicated that future careers does not require physics, 15.0 % of the students indicated that inadequacy of physics learning resources will make them drop physics, 4.7 % of the students indicate that they are being discouraged by friends to take physics while 1.6 % of the students indicated that they are being discouraged by physics teachers to take physics.

The study sought information from form three students to find out the reasons students had for choosing physics. The results are as shown Table 16.

Table 16
Reasons for those who Chose Physics

	Frequency	Percent
Performance in physics is good	23	54.8
Future career require physics	6	14.3
Adequacy of learning resources in physics	9	21.4
Encouragement by friends	3	7.1
Encouragement by physics teacher	1	2.4
Total	42	100.0

According to the results in Table 16, 54.8 % of the students indicated that good performance in physics made them to choose physics, 14.3 % of the students indicated that their future career require physics hence they choose physics, 21.4% of the students indicated that Physics has adequate learning resources hence they

choose physics, 7.1 % indicated that they were encouraged by friends to take physics while 2.4 % indicated that they were encouraged by physic teachers.

The study sought information from form three students to find out the reasons students had for dropping physics. The results are as shown Table 17.

Table 17
Reasons Students had for Dropping Physics

	Frequency	Percent
Performance in physics is poor	93	64.6
Future career doesn't require physics	27	18.8
Inadequacy of learning resources in physics	11	7.6
Discouragement by friends	10	6.9
Discouragement by physics teacher	3	2.1
Total	144	100.0

According to the information in Table 17, 64.6 % of the students indicated that poor performance in physics made them not to choose physics, 18.8% indicated that their future career doesn't require physics hence they did not choose physics, 7.6 % of the students indicated that inadequacy of Physics learning resources made them not to choose physics, 6.9 % indicated that they were discouraged by friends to take physics while 2.1 % indicated that they were discouraged by physic teachers. According to Mugendi (2013) even though students are interested in a subject, the need to perform is more significant thus implying that prior achievement is a significant influence on student course choice in school. From the study it can be concluded that poor performance was the major reason why many students did not choose Physics. The findings concur with findings of a study by Hannan (2006) on school effect on choice of science subjects in Ireland that found that prior success is associated with subsequent take up of scientific subjects.

The study sought information regarding the extent to which teaching method influence enrollment and retention of students in physics. The results are as shown in Figure 3.

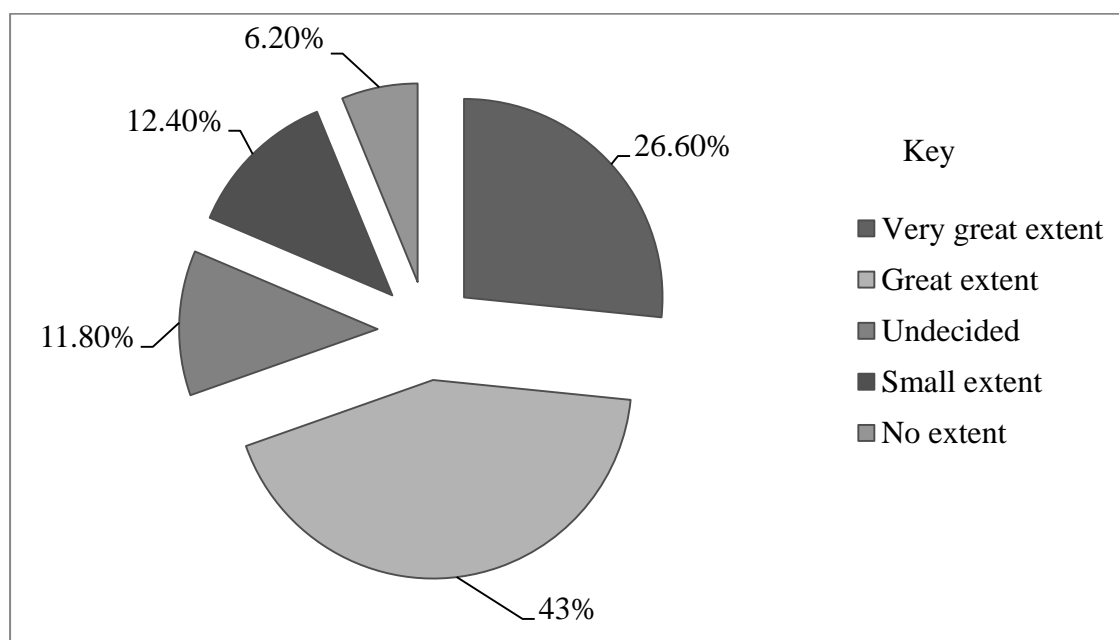


Figure 3. Influence of Teaching Methods to Enrolment and Retention of Students in Physics

According to the information in Figure 3, 26.6% of the students indicated that teaching method influenced their enrolment and retention in physics to a very great extent while 43.0 % and 12.4% of the students indicated that teaching methods influenced their enrolment and retention in physics to a great extent and small extent respectively. The study sought information from teachers regarding the extent to which teaching method influence enrollment and retention of students in physics. The results are as shown in Table.18.

Table 18
Teachers Opinion on Influence of Teaching Method

	Frequency	Percent
Very great extent	1	12.5
Great extent	7	87.5
Total	8	100

According to the results in Table 18, 12.5% and 87.5% of the teachers indicated that teaching method influence students enrolment and retention in physics to a very great extent and great extent respectively.

The study sought information from the students regarding the teaching methods that influenced their enrolment and retention in physics to a very great extent. The results are as shown in Figure 4.

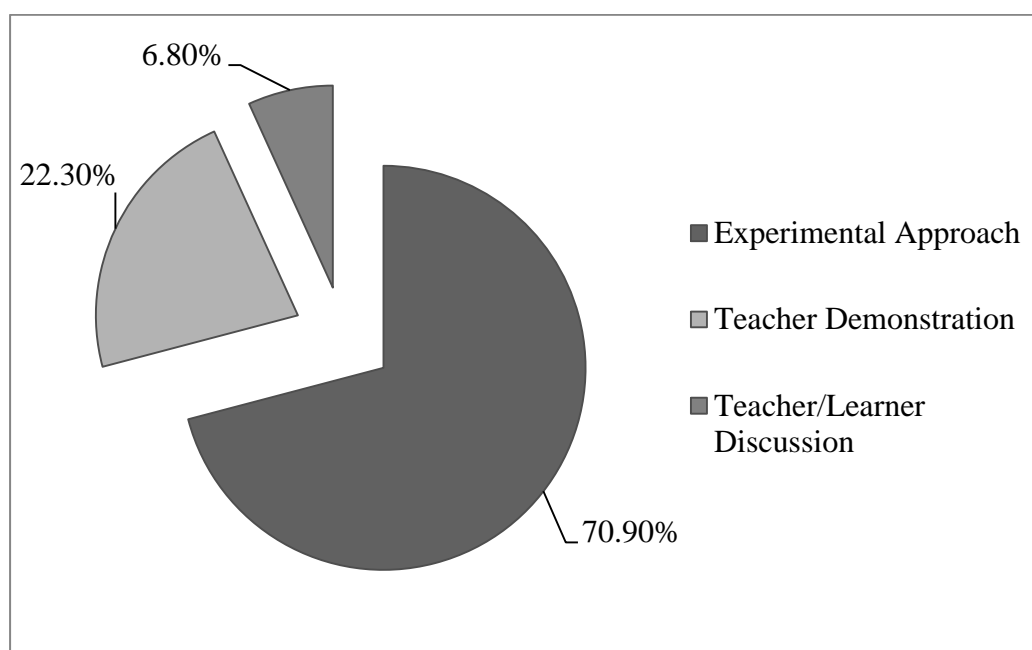


Figure 4. Teaching Methods Influencing Enrolment and Choice of Physics

According to the results in Figure 4, majority of the students (70.9%) indicated that experimental approach influenced their enrolment and retention in physics to a very great extent while 22.3% and 6.8% of the students indicated that teacher demonstration and teacher/ learner discussion respectively influenced their enrolment and retention in physics to a very great. The findings suggest that most of the students were influenced by experimental approach of investigation where students perform experiments individually in their decision to enrol and choose physics.

According to Kiboss (2002), students conceptions about science might be negatively affected by the way the teacher presents the subject. Njoka (2012), argue that there is a significant learning gain obtained by students exposed to science process skill of

experimentation on students' achievement in physics. The mastery of Physics concepts cannot be fully understood without practical as Physics requires an experimental approach of investigation by every student. This suggests that the lack of class experiment led to poor performance in Physics which influence the choice of Physics negatively. The finding concur with a study by Smyth and Hannan (2000) that indicate science take up tends to be higher in schools which emphasize practical work and students' participation in classroom activity at both lower and upper secondary levels.

The study sought information from the students regarding the influence of adequacy of physics textbooks on their enrolment and retention in physics. The results are as shown in Figure 5.

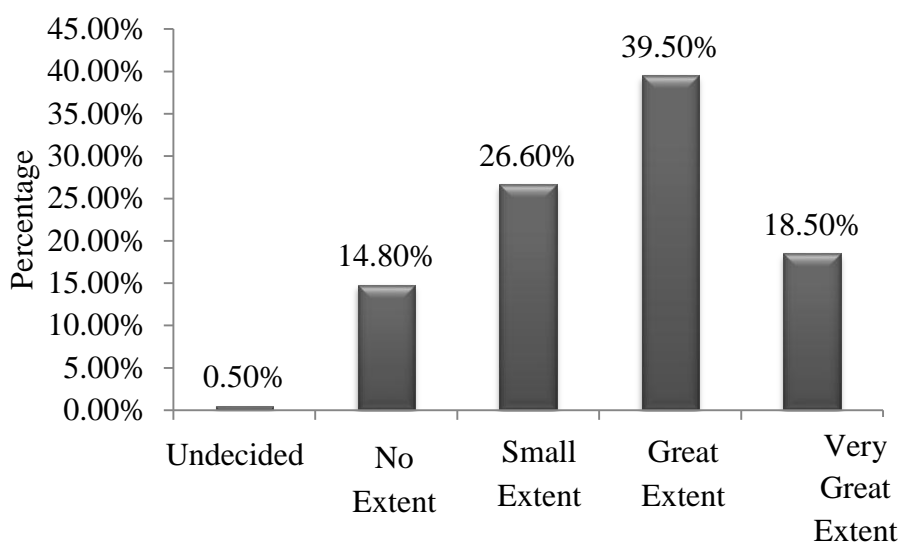


Figure 5. Students Opinion on Influence of Adequacy of Physics Textbook on Enrolment and Retention in Physics

According to the information in Figure 5, 26.6% of the students indicated that adequacy of physics textbooks influenced their enrolment and retention to a small extent while 39.5% and 18.5% of the students indicated that adequacy of physics textbooks influenced their enrolment and retention in physics to a great extent and very great extent respectively. The study revealed that adequacy of physics textbooks influence enrolment and retention of students in physics. Ubogu (2004),

states that textbooks and workbooks with relevant contents and exercises are required for the learner to get the greatest benefit from school education. Ubogu (2004), further argue that text books enable the pupils to follow the teacher’s sequence of presentation and aids in understanding of lessons According to Angura (2003), schools with adequate textbooks, apparatus and other instructional materials perform better. Such materials promote participation and lead to high academic achievement. This suggests that adequacy of physics text books influence students enrolment and retention in physics in secondary schools.

The study sought for the opinion of students on the peer influence towards physics. The results are as shown in Figure 6.

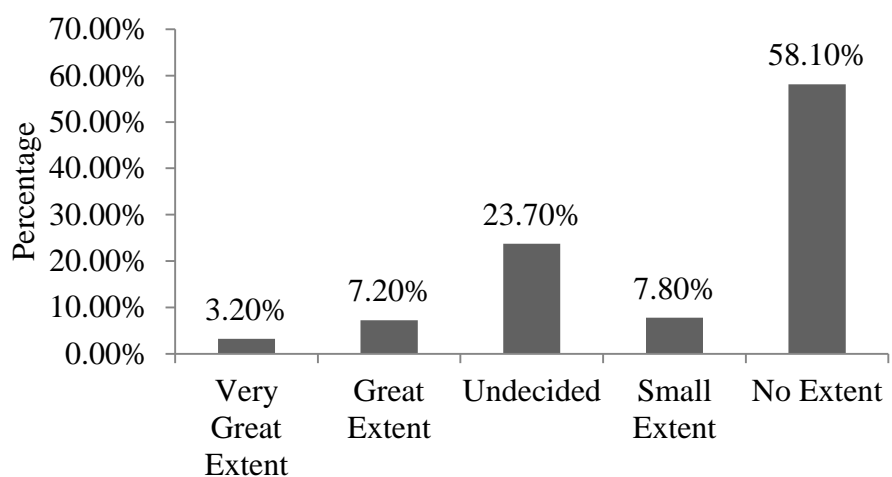


Figure 6. Students Opinion on the peer Influence towards Physics

According to the results in Figure 6, 3.2 % of the respondents indicated that their peers influenced their decision to choose or not to choose physics to very great extent , 7.2 % indicated that their peers influenced their decision to choose or not to choose physics to a great extent, 23.7 % were undecided on this issue while 7.8% indicated that their peers influenced their decision to choose or not to choose physics to a small extent while 58.1% indicated that their peers did not influence their decision to choose or not to choose physics.

The study sought for the opinion of teachers regarding students peer influence towards physics. The results are as shown in Table 19.

Table 19

Teachers Opinion on Influence of peer pressure

	Frequency	Percent
Small extent	2	25
No extent	6	75
Total	8	100

According to the results in Table 19, 25% of the teachers indicated that peer pressure influence students choice of Physics to a small extent while 75% indicated that peer pressure does not influence students' choice of Physics. The findings of this study suggest that most of the students were not influenced by peer pressure in choice of Physics. The findings disagree with findings of a study by Owoyele and Toyobo (2008) on influence of parental will, peer pressure and academic ability on school subject selection by students in senior secondary schools who found out that peer pressure influence choice of Physics.

The Researcher Sought Information regarding suggestions to improve the enrolment and retention of students in physics. The results are as shown in Table 20.

Table 20

Suggestions to Improve Enrolment and Retention of Students in Physics

	Frequency	Percent
Thorough syllabus coverage by physics teachers to improve performance	158	42.5
Pace of content delivery to be suitable for all learners	115	30.9
Government to employ enough and balance gender of physics teachers	99	26.6
Total	372	100.0

According to the information in Table 20, 42.5 % of the students' indicated that there is need for thorough syllabus coverage by physics teachers to improve performance in physics, 30.9% of the students' indicated that pace of content delivery should be suitable for all learners while 26.6 % of the students indicated that there is need for the government to employ enough and balanced gender of physics teachers to improve enrolment and retention of students in physics

4.4 Early Childhood Experiences and Enrolment and Retention of Students in Physics

The study sought information from the students on the extent to which playing with electrical gadgets during childhood influence enrolment and retention of students in physics. The results are as shown in Figure 7.

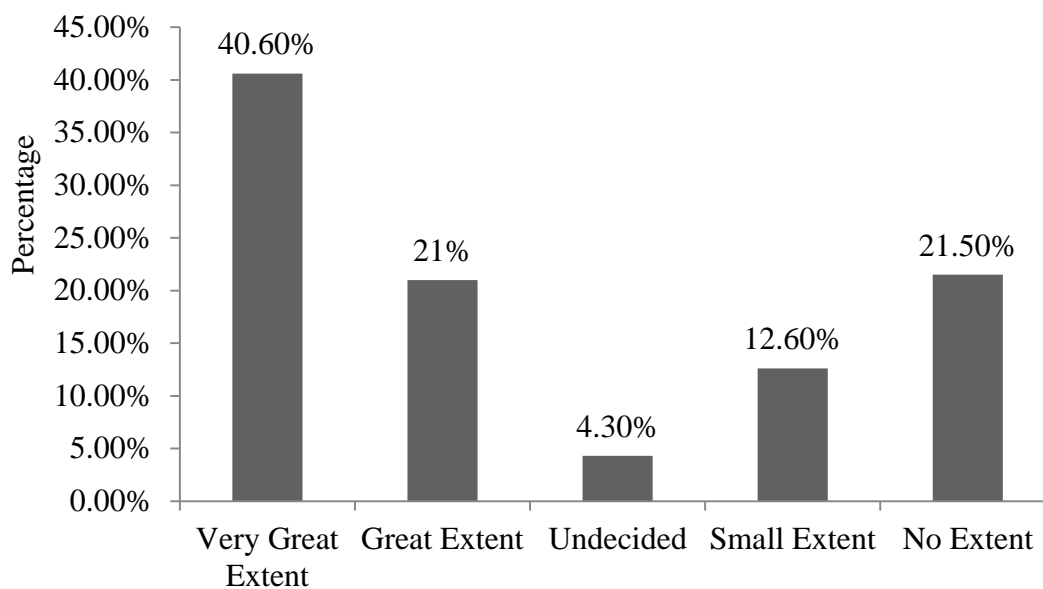


Figure 7. Influence of Playing with Electrical Gadgets on Enrolment and Retention

According to the information in Figure 7, 61.6% of the students indicated that playing with electrical gadgets during early childhood influenced their decision to enroll and choose physics. 4.3 %, of the students were undecided on the issue while 34.1 % of the students indicated that playing with electrical gadgets during early childhood did not influence their decision to enroll and choose physics

The study sought information from teachers on the extent to which playing with electrical gadgets during childhood influence enrolment and retention of students in physics. The results are as shown in Table 21.

Table 21

Teachers Opinion on Influence of Playing with Electrical Gadgets

	Frequency	Percent
Very great extent	3	37.5
Great extent	4	50.0
No extent	1	12.5
Total	8	100

According to the results in Table 21, 37.5% and 50.0% of the teachers indicated that playing with electrical gadgets during early childhood influenced students' decision to enroll and choose physics to a very great extent and great extent respectively while 12.5% of the teachers indicated that playing with electrical gadgets during early childhood does not influence students' decision to enroll and choose physics..

The study sought information on the extent to which making mechanical and electrical models at childhood influence enrolment and retention of students in physics. The results are as shown in Figure 8.

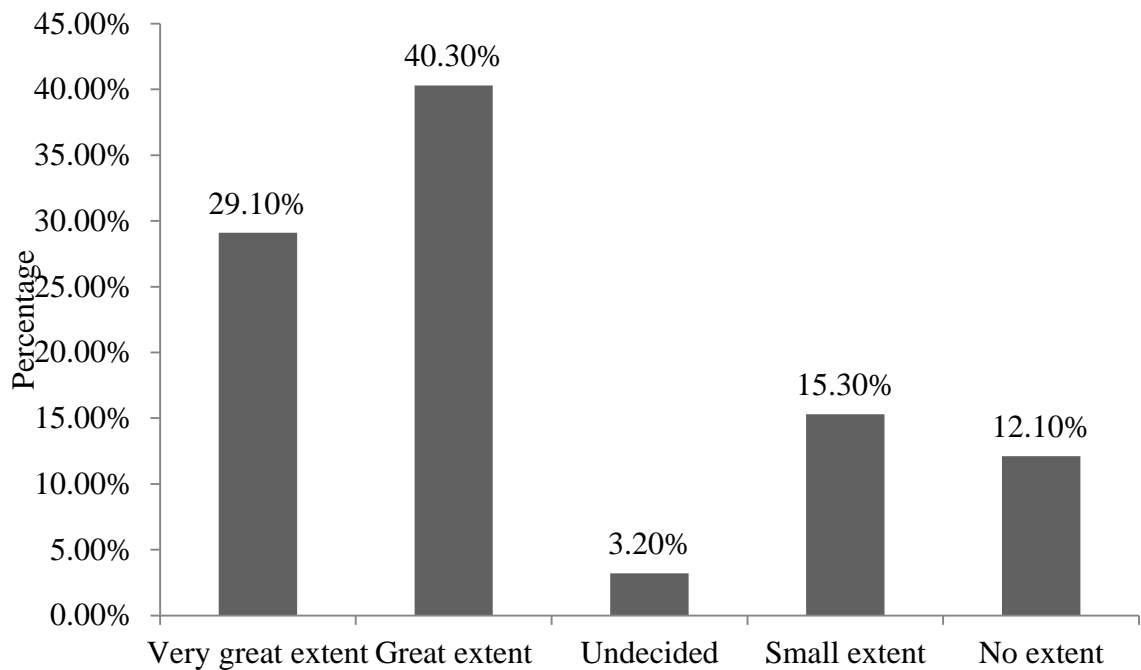


Figure 8. Influence of making mechanical and electrical Models on Enrolment and Retention

According to the information in Figure 8, 69.4 % of the students indicated that making mechanical and electrical models during early childhood influenced their decision to enroll and choose physics while 27.4 % of the students indicated that making models during early childhood didn't influence their decision to enroll and choose physics.

The study sought information from teachers regarding extent to which making mechanical and electrical models at childhood influence enrolment and retention of students in physics. The results are as shown in Table 22.

Table 22
Teachers Opinion on Influence of Mechanical and Electrical Models

	Frequency	Percent
Very great extent	5	62.5
Great extent	2	25.0
No extent	1	12.5
Total	8	100

According to the results in Table 22, 62.5% and 25.0% of the teachers indicated that making mechanical and electrical models during early childhood influence students decision to enroll and choose physics to a very great extent and great extent respectively while 12.5% of the teachers indicated that making mechanical and electrical models during early childhood does not influence students' decision to enroll and choose physics.

According to the findings of the study, most of the respondents indicated that play with electrical gadgets, making mechanical and electrical models influence students' decision to enroll and retain physics. The study thus suggests that most of the students are influenced by the nature of the early childhood experiences in choice of Physics. These findings agree with findings of George and Taylor (2001), Hoffman (2002), Munro and Elsom (2003) that students' early science learning experiences are influential in students physics enrolment decisions.

The study sought information from the students regarding early childhood experiences that need to be promoted to improve their enrolment and retention of in physics in secondary schools.

The students sampled raised various early childhood experiences that in their opinion would help in improving enrolment and retention of students in physics in secondary schools. The results are as shown in Table 23.

Table 23

Early Childhood Experiences that May Improve students Enrolment and Retention in Physics

Early Childhood Experiences	Frequency	Percent
Exposure to electrical gadgets	12	3.2
Visit to industries	22	5.9
Computer games	21	5.6
Dismantling of watches torches and radios	24	6.5
Visit to airports	26	7.0
Visit to buildings with lifts	14	3.8
Encourage on physics based careers	6	1.6
Exposure to physics role models during childhood	10	2.7
Engagement in science fiction video games	69	18.5
Helping children to make models with standard materials that will make them love and like physics	7	1.9
Introduce physics laboratory equipment and experiments in primary school	14	3.8
Provision of variety of toys where physics knowledge is demonstrated	14	3.8
Playing with kites	12	3.2
Playing with magnets	26	7.0
Visit to power generating stations	13	3.5
Reading the subject and loving it	12	3.2
Discussions on natural phenomena based on physics	6	1.6
Use binoculars , telescope and microscope	12	3.2
Video games	16	4.3
Discussions on the importance of physics	21	5.6

The study sought information from the teachers regarding early childhood experiences that should be promoted to improve students' enrolment and retention of in physics in secondary schools. The results are as shown in Table 24.

Table 24
Suggestions to Improve Enrolment and Retention of Students in Physics

	Frequency	Percent
Students exposure to gadgets that employ physics knowledge such as lifts, merry go round and aircrafts	5	62.5
Provision of variety of toys that demonstrate knowledge of physics during early childhood	3	37.5
Total	8	100.0

According to the results in Table 24, 62.5 % of the teachers proposed that students should be exposed to aircrafts, lifts and, merry go round while 37.5% of the teachers indicated that variety of toys that demonstrate knowledge of physics should be provided to children during their early childhood. The study suggest that students who are exposed to physics based activities, toys, games and gadgets have greater interest in physics because of the existing knowledge that they have which play an important role in understanding concepts in physics. These findings concur with those of Tuaundu (2009) that revealed that there should be a strong bond between Physics contents and students everyday experiences.

4.5 Socio-Cultural Experiences and Enrolment and Retention of Students in Physics

The Researcher Sought Information from teachers regarding extent which gender stereotyping of carrying out construction and technical work at home influence enrolment and retention of students in physics. The results are as shown in Figure 9.

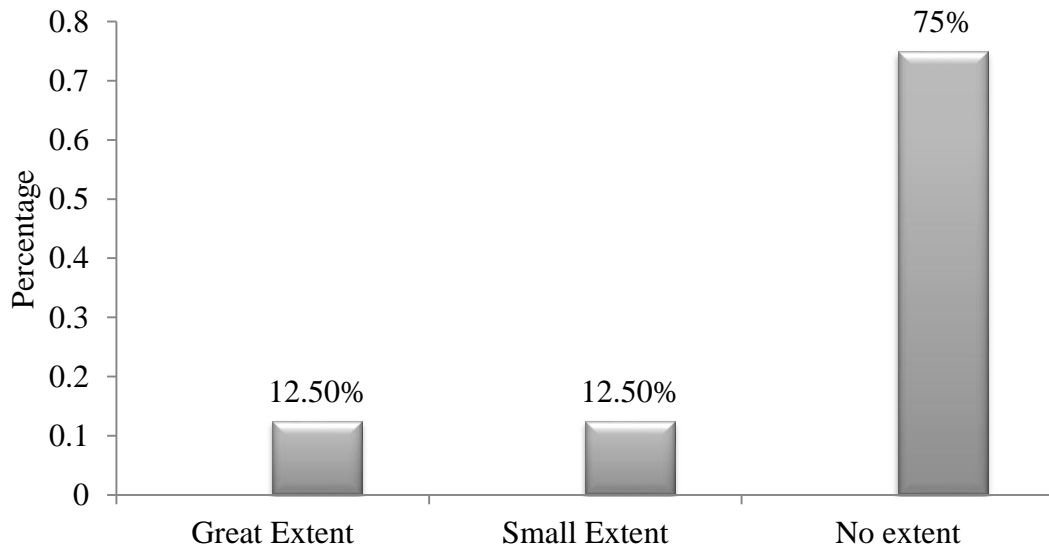


Figure 9. Influence of Gender Stereotyping of Carrying out Construction and Technical Work at Home on Enrolment and Retention in Physics

According to the information in Figure 9, 75.5 % of the teachers indicated that engagement in technical and constructional work at home doesn't influence enrolment and retention of students in physics while 12.5 % and 12.5% of the teachers indicated that that engagement in technical and constructional work at home influence enrolment and retention of students in physics to a great extent and small extent respectively

The Researcher Sought Information from students regarding extent which carrying out construction and technical work at home influence their enrolment and retention in physics. The results are as shown in Table 25

Table 25

Influence of Gender Stereotyping Construction and Technical work

	Frequency	Percent
Very great extent	21	5.6
Great extent	64	17.2
Small extent	287	77.2
Total	372	100.0

According to the results in Table 25, 77.2% of the respondents indicated that their engagement in constructional and technical work doesn't influence their enrolment and retention in physics while 5.6% and 17.2% of the respondents indicated that their engagement in constructional and technical work influenced their enrolment and retention in physics to a very great extent and to a great extent respectively

The Researcher Sought Information from students regarding the influence of gender stereotyping of play with soft toys and engagement in easy task in their enrolment and retention in physics. The results are as shown in Figure 10.

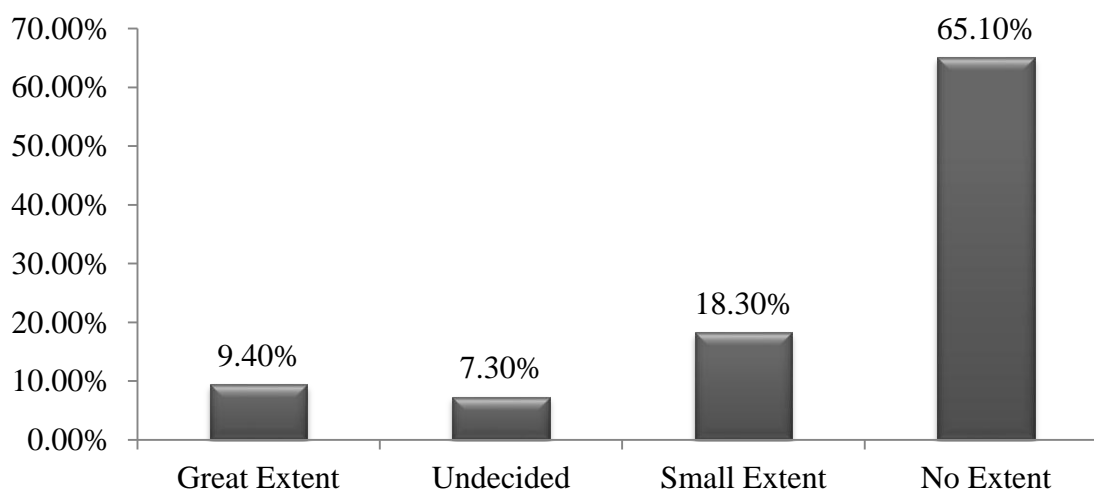


Figure 10. Influence of Gender Stereotyping of Play with soft toys and

Engagement in easy task on Enrolment and Retention of Students in Physics.

According to the results in Figure 10, 65.10% of the students indicated that play with soft toys and engagement in easy task doesn't influence their decision to enrol

and choose physics while 9.4 and 18.3 % of the students indicated that play with soft toys and engagement in easy task influence their decision to enrol and choose physics to great extent and small extent respectively The findings of this study reveals that most of the students are not affected by their gender roles in choice of Physics.

These findings disagree with findings of Baker and Leary (2003) who found out that childhood socialization and altruistic reasons for choosing science have been reported to develop gendered identities. The finding also disagree with that of Farenga and Joyce (1999) , in the study of course preferences of young students between the ages of 9 to 13 in the USA, that reported a strong gender effect where both boys and girls perceived physical science and technology-related courses as appropriate subjects for boys to study and life sciences as appropriate subjects for girls to study.

The Researcher Sought Information from the teachers regarding the influence of gender stereotyping naming units, constants and principles after male scientists on enrollment and retention of students in physics.. The results are as shown in Table 26

Table 26

Influence of Gender Stereotyping naming Constants and Principles after Male Scientists

	Frequency	Percent
Strongly agree	1	12.5
Agree	5	62.5
Disagree	2	37.5
Total	8	100.0

According to the results in Table 26, 12.5 % and 62.5% of the teachers indicated that they strongly agree and agree respectively that naming constants and principles after male scientists influence enrolment and retention of students in physics while 37.5% of the teachers indicated that they disagree that naming constants and principles after male scientists influence enrolment and retention of students in physics

The Researcher Sought Information from the students regarding the influence of gender stereotyping naming units, constants and principles after male scientists in their enrollment and retention in physics. The results are as shown in Figure 11.

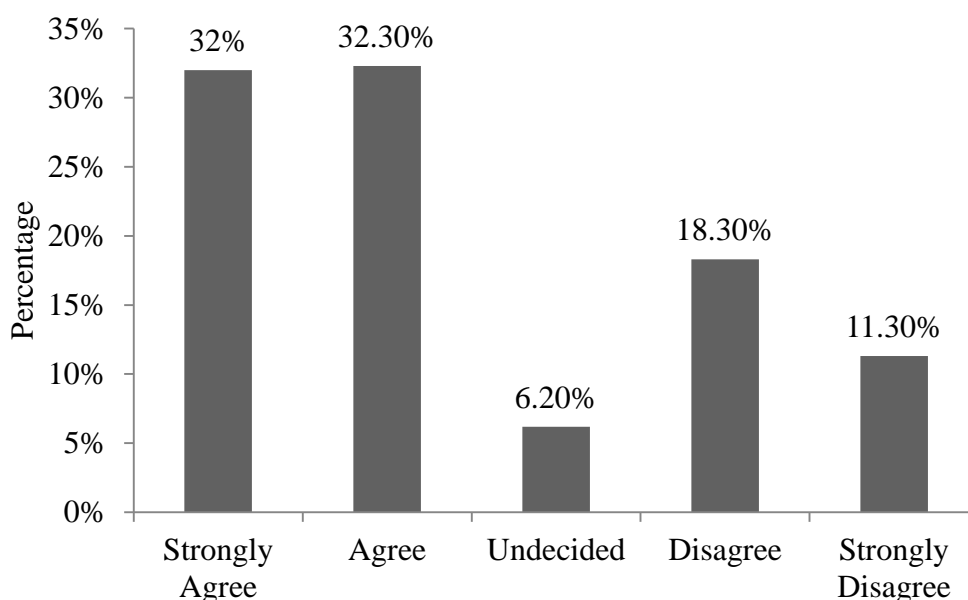


Figure 11. Influence of Gender Stereotyping naming Constants and Principles after Male Scientists on Enrolment and Retention of Students in Physics

According to the information in Figure 11, 32 % and 32.3% of the students indicated that they strongly agree and agree respectively while 18.3% and 11.3% of the students indicated that they disagree and strongly disagree respectively that naming constants and principles after male scientists influence enrolment and retention of students in physics. The findings reveal that naming of constants and principles after male scientists influence enrolment and retention of students in physics. These findings concur with those of Harding and Parker (1995) that revealed that the frequent depiction of males as associated with the physical sciences, for example the frequent association of advances in the physical sciences with men and the naming of units, laws, constants, hypotheses, equations and experiments after male scientists, gives science a male bias.

The Researcher Sought Information from the students regarding suggestions to improve their enrolment and retention in physics. The results are as shown in Table 27.

Table 27

Suggestions to Improve Enrolment and Retention of Students in Physics

	Frequency	Percent
Correct misconceptions that have been instilled to student about physics	235	63.2
Demystify the notion that physics related field is mainly a male domain	137	36.8
Total	372	100.0

According to the information in Table 27, 63.2 % of the students' indicated that misconceptions instilled to student about physics should be corrected while 36.8 % of the students indicated that the notion that physics related field is a male domain should be demystified to improve the enrolment and retention of students in physics.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary and conclusions drawn from the study. The chapter also presents the recommendations based on the findings of the study and the suggestions for further research.

5.2 Summary of Findings

From the findings, either chemistry or biology is compulsory during subject selection in most secondary schools in Imenti sub-county but none of the schools let physics to be compulsory, an indication that the school policies on choice of science subjects influence students' enrolment and retention in physics. The study established that most of the students in Imenti south sub-county were guided on career choice before they selected their science subjects an indication that most of the students were not influenced by lack of guidance on career in their choice of physics. Most of the respondents indicated that inadequacy of apparatus influence enrolment and retention of student in physics an indication that students in Imenti south sub-county are influenced by inadequacy of apparatus in their choice of physics

The study revealed that poor performance negatively influence students choice of physics in Imenti south sub-county as indicated by most of the form three students who did not choose physics and more than half of the form two students who were not willing to choose physics because of poor performance. The study established that in Imenti south sub-county students were mostly influenced by experimental approach of investigation in their choice of physics an indication that teaching method influence enrolment and retention of students in physics. From the findings, more than half of the students were not influenced by their peers in their choice of physics, an indication that students' choice of physics was not affected negatively by peer pressure

The study revealed that playing with electrical gadgets and making mechanical and electrical models during early childhood influence students' decision to enrol and choose physics as indicated by most of the respondents who agreed that playing with

electrical gadgets and making models during early childhood influence students' decision to enroll and choose physics. According to the study students should be exposed to gadgets that employ physics knowledge during early childhood such as aircrafts, lifts, calculators, merry go round, and any other gadgets that employ physics knowledge.

The study further established that engagement in technical and constructional work at home and playing with soft toys and engagement in easy task had no influence on enrolment and retention of students in physics as indicated by most of the respondents. Majority of the respondents agreed that naming constants and principles after male scientists influence enrolment and retention of students in physics. According to the study enrolment and retention of students in physics can be improved by adequate coverage of the syllabus by the students, exposing student to early childhood experiences that demonstrates knowledge of physics, correcting misconceptions that have been instilled to students about physics and elimination of abstract ideas that are beyond the scope of a high school student as suggested by most of the respondents.

5.3 Conclusions

To curb low enrolment and retention of students in physics in secondary schools , there is need for the stake holders in the ministry of education to ensure that measures are put in place to improve performance of students in physics through provision of adequate teaching and learning apparatus, sensitizing physics teachers on the need of letting the students to perform the experiments individually and encouraging parents to expose their children to activities that demonstrate the knowledge of physics during their childhood. Otherwise, if such measures are not put in place low enrolment and retention of students in physics will continue to be experienced in secondary schools.

5.4 Recommendations

In line with the findings of the study, the following recommendations are made:

- i. The government through the MOE should encourage teachers to improvise apparatus that are inadequate or lacking for effective teaching and learning

of physics to take place and by doing so physics performance will be enhanced which will led to increase in enrolment and retention of students in physics.

- ii. The government through the MOE should encourage more females to train in physics in order to demystify the notion that physics is mainly a male domain.
- iii. The parents and the guardians should expose their children to experiences and activities that promote the knowledge of physics.

5.5 Suggestion for Further Research.

Based on the findings, the following suggestions for further research are made:

- i. There is need for an empirical study to establish factors influencing enrolment and retention of students in other science subjects.
- ii. There is need to research on the impact of experimental approach of investigation on students' performance in physics, where a student performs experiments individually.
- iii. There is need to research the impact of parental involvement in career development of their children on enrolment and retention of students in physics.

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APPENDIX I
QUESTIONNAIRE FOR TEACHERS OF PHYSICS

This research is purely meant for academic purpose. It intends to find out factors that influence enrollment and retention of students in physics in secondary schools in Imenti Sub-County in Meru County. This questionnaire has 5 sections: A, B, C, D and E. section A is on demographic data; section B is on school based experiences; section C is on early childhood experiences and section D is socio- cultural experiences influencing enrolment and retention of students in physics and section E is on suggestions to improve enrolment and retention of students in physics. You are kindly requested to provide answers to these questions as honestly and as precisely as possible. Your answers to these questions will be treated as confidential. Please do not write your name or that of your school anywhere on this questionnaire, only fill in the requested information on the spaces provided.

Please Tick the Most Applicable

SECTION A: DEMOGRAPHIC INFORMATION

1. Your Gender: () Male () Female
2. Your Age: () Between 20-29 () Between 30-39 () Between 40-49 () 50
And Above
3. Highest Level of Education:
() Master's Degree () Bachelor's Degree (Bachelor's Degree
() Diploma
Other
Specify.....
4. Are you trained to teach physics? Yes () No ()
5. How many years have you been teaching physics?
() less than 2 years
() 2-5 years
() 6-10 years
() 11-15 years

SECTION B: SCHOOL BASED EXPERIENCES

6. (a) Does your school offer all the three sciences? Yes () No ()
- (b) If your school offers all the three sciences, what is the policy on choosing?
- i) Students are free to take all the three sciences ()
 - ii) Students are allowed to freely choose 2 sciences ()
 - iii) Chemistry is compulsory, choice is between Biology and Physics ()
 - iv) Biology is compulsory, choice is between Chemistry and Physics ()
 - v) Physics is compulsory, choice is between Biology and Chemistry ()
7. What extent does your school policy of choosing science subjects influence students enrolment and retention in physics?
- (i) Very great extent ()
 - (ii) Great extent ()
 - (iii) Small extent ()
 - (iv) No extent ()
8. What extent does the adequacy of the following physics facilities influence enrolment and retention of students in physics?

	Very Great extent	Great extent	Undecided	Small extent	No extent
(i) Laboratories					
(ii) Apparatus					
(iii) Text books					
(iv) Reference books					

9. Who offers career guidance to students before choosing the science subjects?
- (i) Teachers ()
 - (ii) Peers ()

(iii) Parents ()

(iv) No body ()

10. (a). What extent does the teaching method used in teaching Physics influence students enrolment and retention in physics?

(i) Very great extent ()

(ii) Great extent ()

(iii) Small extent ()

(iv) No extent ()

(v) Undecided ()

(b). Which teaching method influenced students enrolment and retention in physics to a great extent?

(i) Teacher demonstration ()

(ii) Experimental approach of investigation by every student ()

(iii) Teacher/learner discussion ()

(iv) Lecture method/notes dictation ()

11. .What reasons do your students have;

(a) For choosing physics?

(i) Future career needs physics ()

(ii) Performance in physics is good ()

(iii) Physics has adequate learning resources ()

(iv) Encouragement by best friends me to take the subject ()

(v) Encouragement by physics teacher to choose physics ()

(vi) Any other specify.....

(b) For dropping physics.

(i) Performance in physics is poor ()

(ii) Future career doesn't require physics ()

(iii) Inadequacy of learning resources in physics ()

(iv) Discouragement by best friends ()

(v) Discouragement by physics teacher ()

(vi) Any other specify.....

12. What extent does the following school based experiences influence enrolment and retention of students in physics in secondary schools?

	Very great extent	Great extent	Undecided	Small extent	No extent
(i) Exposure to career guidance					
(ii) Availability of teaching and learning resources					
(iii) School policy on choosing the science subjects					
(iv) Teaching methods used in teaching physics					
(v) Past performance of the school in physics in KCSE					
(vi) Students performance in physics					
(vii) Peer influence					

13. What suggestions would you give regarding school based experiences to improve enrolment and retention of students in physics in secondary schools?

SECTION C: EARLY CHILDHOOD EXPERIENCES

14. What extent does the following early childhood experiences influence enrolment and retention of students in physics?

	Very great extent	Great extent	Undecided	Small extent	No extent
(i) Play with					

electrical gadgets					
(ii) Making models e.g airplanes, boats and lorries					
(iii)Balancing on a seesaw					
(iv) Play with magnets					
(v) Dismantling of watches, torches and radios					
(vi) Swimming using rafts					
(vii) Play with toys like trains, cars, guns and aeroplane					
(viii) Play with catapults					
(ix) Making arrows and bows					
(x) Computers games					
(xi) Making homemade wheelbarrows					
(xii) Play with kites					
(xiii) Using binoculars, microscopes and telescopes					
(xiv) Use of mobile phones and mobile phone cameras					
(xv) Play with explosives (match stick powder and nail)					
(xvi) Watching television					

(xvii) Engagement in science fiction video games					
(xviii) Making potato cannons					

15. What suggestions would you give regarding early childhood experiences to improve enrolment and retention of students in physics in secondary schools?

.....

SECTION D: SOCIAL- CULTURAL EXPERIENCES

16. What extent does the following social cultural experiences influence enrolment and retention of students in physics in secondary schools?

	Very great extent	Great extent	Undecided	Small extent	No extent
(i) Constructional and technical work at home is carried out by boys					
(ii) Girls are meant to assist their mothers in house work					
(iii) Boys are adventurous and forceful					
(iv) Girls are only allowed to play with soft toys and to engage in					

easy task					
(v) Boys engage in hobbies and interests dealing with electrical and mechanical devices					
(vi) Girls are encouraged to participate in activities which are creative e.g drawing, reading.					

17. What extent do you agree with the following statements in contributing to low enrolment in physics?

	Strongly agree	Agree	Undecided	Disagree	Strongly disagree
(i) Naming of units, laws, constants and principles after male scientists gives physics a male bias					
(ii) Physics related professions are masculine.					

18. What suggestions would you give regarding social cultural experiences to improve enrolment and retention of students in physics in secondary schools?

.....

.....

.....

APPENDIX II
QUESTIONNAIRE FOR STUDENTS (A)

This research is purely meant for academic purpose. You are kindly requested to provide answers to the questions as honestly and as precisely as possible. Your answers to these questions will be treated as confidential. This questionnaire has 5 sections; A, B, C, D and E. Section A is on demographic data, section B is on school based experiences; section C is on early childhood experiences and section D is on social cultural experiences and Section E is on suggestions to improve enrollment and retention of students in physics. Please tick or fill in the appropriate answers in the spaces provided. Please do not write your name or that of your school anywhere on this questionnaire.

SECTION A: DEMOGRAPHIC DATA

1. Your gender () Male () Female
2. Age () 13 () 14 () 15 () 16 () 17 and above
3. What is your parents' highest education level?

Father: () University () Diploma () Certificate () Form Six / Four ()
Below Form Four

Mother: () University () Diploma () Certificate () Form Six / Four ()
)
Below Form Four

SECTION B: SCHOOLS BASED EXPERIENCES

4. (a) Does your school offer all the three sciences? Yes () No ()
(b) If your school offers all the three sciences, what is the policy on choosing?
 - i) Students are free to take all the three sciences ()
 - ii) Students are allowed to freely choose 2 sciences ()
 - iii) Chemistry is compulsory, choice is between Biology and Physics ()
 - iv) Biology is compulsory, choice is between Chemistry and Physics ()
 - v) Physics is compulsory, choice is between Biology and Chemistry ()
5. What extent does your school policy of choosing science subjects influence your enrolment and retention in physics?
 - (i) Very great extent ()

- (ii) Great extent ()
- (iii) Small extent ()
- (iv) No extent ()

6. What extent does the adequacy of the following physics facilities influence your enrolment and retention in physics?

	Very Great extent	Great extent	undecided	Small extent	No extent
(i) Laboratories					
(ii) Apparatus					
(iii) Text books					
(iv) Reference books					

7. Who offers career guidance to students before choosing the science subjects in your school?

- (i) Teachers ()
- (ii) Peers ()
- (iii) Parents ()
- (iv) No body ()

8. (a). what extent does the teaching method used in teaching Physics by your teacher influence your enrolment and retention in physics?

- (i) Very great extent ()
- (ii) Great extent ()
- (iii) Small extent ()
- (iv) No extent ()
- (v) Undecided ()

(b). Which teaching method influenced your enrolment and retention in physics to a great extent?

- (v) Teacher demonstration ()
- (vi) Experimental approach of investigation by every student ()
- (vii) Teacher/learner discussion ()
- (viii) Lecture method/notes dictation ()

9. .What reasons do you have;

(a) For choosing physics?

- (i) Future career needs physics ()
- (ii) Performance in physics is good ()
- (iii) Physics has adequate learning resources ()
- (iv) Encouragement by best friends me to take the subject ()
- (v) Encouragement by physics teacher to choose physics ()
- (vi) Any other specify.....

(b) For dropping physics.

- (i) Performance in physics is poor ()
- (ii) Future career doesn't require physics ()
- (iii) Inadequacy of learning resources in physics ()
- (iv) Discouragement by best friends ()
- (v) Discouragement by physics teacher ()
- (vi) Any other specify.....

10. What extent does the following school based experiences influence enrolment and retention of students in physics in secondary schools?

	Very great extent	Great extent	Undecided	Small extent	No extent
(i) Exposure to career guidance					
(ii) Availability of teaching and learning resources					
(iii) School policy on					

choosing the science subjects					
(iv) Teaching methods used in teaching physics					
(v) Past performance of the school in physics in KCSE					
(vi) Students performance in physics					
(vii) Peer influence					

11. What suggestions would you give regarding school based experiences to improve enrolment and retention of students in physics in secondary schools?

SECTION C: EARLY CHILDHOOD EXPERIENCES

12. What extent does the following early childhood experiences influence enrolment and retention of students in physics?

	Very great extent	Great extent	Undecided	Small extent	No extent
(i) Play with electrical gadgets					
(ii) Making models e.g airplanes, boats and lorries					
(iii) Balancing on a seesaw					
(iv) Play with magnets					
(v) Dismantling of					

watches, torches and radios					
(vi) Swimming using rafts					
(vii) Play with toys like trains, cars, guns and aeroplane					
(viii) Play with catapults					
(ix) Making arrows and bows					
(x) Computers games					
(xi) Making homemade wheelbarrows					
(xii) Play with kites					
(xiii) Using binoculars, microscopes and telescopes					
(xiv) Use of mobile phones and mobile phone cameras					
(xv) Play with explosives (match stick powder and nail)					
(xvi) Watching television					
(xvii) Engagement in science fiction video games					
(xviii) Making potato cannons					

13. What suggestions would you give regarding childhood experiences to improve enrolment and retention of students in physics in secondary schools

.....

SECTION D: SOCIAL- CULTURAL EXPERIENCES

14. What extent does the following social cultural experiences Influence enrolment and retention of students in physics?

	Very great extent	Great extent	Undecided	Small extent	No extent
(i) Constructional and technical work at home is carried out by boys					
(ii) Girls are meant to assist their mothers in house work					
(iii) Boys are adventurous and forceful					
(iv) Girls are only allowed to play with soft toys and to engage in easy task					
(v) Boys engage in hobbies and interests dealing with electrical and mechanical devices					
(vi) Girls are encouraged to participate in activities which are creative e.g drawing, reading.					

15. What extent do you agree with the following statements in contributing to low enrolment and retention of physics?

	Strongly agree	Agree	Undecided	Disagree	Strongly disagree
(i) Naming of units, laws, constants and principles after male scientists gives physics a male bias.					
(ii) Physics related professions are masculine.					

.....

16. What suggestions would you give regarding social cultural experiences to improve the enrolment and retention of student in physics in secondary schools?

.....

APPENDIX III
QUESTIONNAIRE FOR STUDENTS (B)

This research is purely meant for academic purpose. You are kindly requested to provide answers to the questions as honestly and as precisely as possible. Your answers to these questions will be treated as confidential. This questionnaire has 5 sections; A, B, C, D and Section A is on demographic data, section B is on school based experiences; section C is on early childhood experiences and section D is on social cultural experiences and Section E is on suggestions to improve enrollment and retention of students in physics. Please tick or fill in the appropriate answers in the spaces provided. Please do not write your name or that of your school anywhere on this questionnaire.

SECTION A: DEMOGRAPHIC DATA

1. Your gender () Male () Female
2. Age () 13 () 14 () 15 () 16 () 17 and above
3. What is your parents' highest education level?
Father: () University () Diploma () Certificate () Form Six / Four ()
Below Form Four
Mother: () University () Diploma () Certificate () Form Six / Four ()
Below Form Four

SECTION B: SCHOOL BASED EXPERIENCES

4. (a) Does your school offer all the three sciences? Yes () No ()
(b) If your school offers all the three sciences, what is the policy on choosing?
 - i) Students are free to take all the three sciences ()
 - ii) Students are allowed to freely choose 2 sciences ()
 - iii) Chemistry is compulsory, choice is between Biology and Physics ()
 - iv) Biology is compulsory, choice is between Chemistry and Physics ()
 - v) Physics is compulsory, choice is between Biology and Chemistry ()
5. What extent does your school policy of choosing science subjects influence students enrolment and retention in physics?
 - (i) Very great extent ()
 - (ii) Great extent ()

(iii) Small extent ()

(iv) No extent ()

- 6 What extent does the adequacy of the following physics facilities influence your enrolment and retention in physics?

	Very Great extent	Great extent	Undecided	Small extent	No extent
(i) Laboratories					
(ii) Apparatus					
(iii) Text books					
(iv) Reference books					

1. Who offers career guidance to students before choosing the science subjects in your school?

(i) Teachers ()

(ii) Peers ()

(iii) Parents ()

(iv) No body ()

2. (a). What extent does the teaching method used in teaching Physics influence your enrolment and retention in physics?

(i) Very great extent ()

(ii) Great extent ()

(iii) Small extent ()

(iv) No extent ()

(v) Undecided ()

(b). Which teaching method influenced your enrolment and retention in physics to a great extent?

- (i) Teacher demonstration ()
- (ii) Experimental approach of investigation by every student ()
- (iii)Teacher/learner discussion ()
- (iv)Lecture method/notes dictation ()

3. What reasons do you have for;

(a) Willing to choose physics in form three?

- (i) Future career needs physics ()
- (ii) Performance in physics is good ()
- (iii)Physics has adequate learning resources ()
- (iv)Encouragement by best friends me to take the subject ()
- (v) Encouragement by physics teacher to choose physics ()
- (vi)Any other specify.....

(b).Not willing to choose physics in form three.

- (i) Performance in physics is poor ()
- (ii) Future career doesn't require physics ()
- (iii)Inadequacy of learning resources in physics ()
- (iv)Discouragement by best friends ()
- (v) Discouragement by physics teacher ()
- (vi)Any other specify.....

4. What extent does the following school based experiences influence enrolment and retention of students in physics in secondary schools?

(i)	Exposure to career guidance	Very great extent	Great extent	Undecided	Small extent	No extent
(ii)	Availability of teaching and learning resources					

(iii) School policy on choosing the science subjects					
(iv) Teaching methods used in teaching physics					
(v) Past performance of the school in physics in KCSE					
(vi) Students performance in physics					
(vii) Peer influence					

11. What suggestions would you give regarding school based experiences to improve enrolment and retention in physics in secondary schools?.

SECTION C: EARLY CHILDHOOD EXPERIENCES

12. What extent does the following early childhood experiences influence students' enrolment and retention in physics?

	Very great extent	Great extent	Undecided	Small extent	No extent
(i) Play with electrical gadgets					
(ii) Making models e.g airplanes, boats and lorries					
(iii) Balancing on a seesaw					
(iv) Play with magnets					
(v) Dismantling of watches, torches and radios					
(vi) Swimming using rafts					
(vii) Play with toys like trains, cars, guns and aeroplane					

(viii) Play with catapults					
(ix) Making arrows and bows					
(x) Computers games					
(xi) Making homemade wheelbarrows					
(xii) Play with kites					
(xiii) Using binoculars, microscopes and telescopes					
(xiv) Use of mobile phones and mobile phone cameras					
(xv) Play with explosives (match stick powder and nail)					
(xvi) Watching television					
(xvii) Engagement in science fiction video games					
(xviii) Making potato cannons					

13. What suggestions would you give regarding early childhood experiences to improve enrolment and retention of students in physics in secondary schools?

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

SECTION D: SOCIAL- CULTURAL EXPERIENCES

14. What extent does the following social cultural experiences influence enrolment and retention of students in physics in secondary schools?

	Very great extent	Great extent	Undecided	Small extent	No extent
(i) Constructional and technical work at home is carried out by boys					
(ii) Girls are meant to assist their mothers in house work					
(iii) Boys are adventurous and forceful					
(iv) Girls are only allowed to play with soft toys and to engage in easy task					
(v) Boys engage in hobbies and interests dealing with electrical and mechanical devices					
(vi) Girls are encouraged to participate in activities which are creative e.g drawing, reading.					

15. What extent do you agree with the following statements in contributing to low enrolment and retention of students in physics?

	Strongly agree	Agree	Undecided	Disagree	Strongly disagree
(i) Naming of units, laws, constants and principles after male scientists gives physics a male					

bias.					
(ii) Physics related professions are masculine.					

16. What suggestions would you give regarding social cultural experiences to improve enrolment and retention of students in physics?

.....

.....

APPENDIX IV
REQUIRED SIZE FOR RANDOMLY CHOSEN SAMPLE

N	S	N	S	N	S	N	S
10	10	140	103	550	226	4500	354
15	14	150	108	600	234	5000	357
20	19	160	113	650	241	6000	361
25	24	220	140	700	248	7000	364
30	28	230	144	750	254	8000	367
35	32	240	148	800	260	9000	368
40	36	250	152	1200	291	10000	370
45	40	260	155	1300	297	15000	375
50	44	270	159	1400	302	20000	377
55	48	280	162	1500	306	30000	379
60	52	290	165	1600	310	40000	380
65	56	300	169	1700	313	50000	381
70	59	320	175	1800	317	75000	382
75	63	340	181	1900	320	100000	384
80	66	360	186	2000	322		
85	70	380	191	2200	327		
90	73	400	196	2400	331		
95	76	420	201	2600	335		
100	80	440	205	2800	338		
110	86	460	210	3000	341		
120	92	480	214	3500	346		
130	97	500	217	4000	351		

N = Population Size

S = Sample Size

Source : Kathuri J.N & Pals DA (1993)

APPENDIX V
RESEARCH PERMIT



NATIONAL COMMISSION FOR SCIENCE,
TECHNOLOGY AND INNOVATION

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Ref: No.

Date:

24th March, 2015

NACOSTI/P/15/5336/5261

Kairo Catherine Nkirote
Chuka University
P.O. Box 109-60400
CHUKA.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on “*Factors influencing enrollment and retention of students in physics in secondary schools in Imenti South Sub-County Kenya,*” I am pleased to inform you that you have been authorized to undertake research in **Meru County** for a period ending **18th March, 2016**.

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

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


DR. S. K. LANGAT, OGW
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner
Meru County.

The County Director of Education
Meru County.

RESEARCH PERMIT

CONDITIONS

1. You must report to the County Commissioner and the County Education Officer of the area before embarking on your research. Failure to do that may lead to the cancellation of your permit
2. Government Officers will not be interviewed without prior appointment.
3. No questionnaire will be used unless it has been approved.
4. Excavation, filming and collection of biological specimens are subject to further permission from the relevant Government Ministries.
5. You are required to submit at least two(2) hard copies and one(1) soft copy of your final report.
6. The Government of Kenya reserves the right to modify the conditions of this permit including its cancellation without notice *A. K. M. M. M.*



REPUBLIC OF KENYA



National Commission for Science, Technology and Innovation

RESEARCH CLEARANCE PERMIT

Serial No. A 4637

CONDITIONS: see back page

research in Meru County

on the topic: **FACTORS INFLUENCING ENROLLMENT AND RETENTION OF STUDENTS IN PHYSICS IN SECONDARY SCHOOLS IN IMENTI SOUTH SUB-COUNTY KENYA**

for the period ending:
18th March, 2016

Applicant's
Signature

[Signature]
for Director General
National Commission for Science, Technology & Innovation