FACTORS INFLUENCING GIRLS’ LOW ENROLMENT AND POOR PERFORMANCE IN PHYSICS: THE CASE OF SECONDARY SCHOOLS IN NANDI SOUTH DISTRICT, KENYA.

BY

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A THESIS SUBMITTED IN PARTIAL FULFILMENT FOR THE AWARD OF THE DEGREE OF MASTER OF EDUCATION TO THE SCHOOL OF EDUCATION OF KENYATTA UNIVERSITY.

MAY, 2014
DECLARATION

This is my original work and has not been presented for any study in another university

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DEDICATION

This study is dedicated to my family for the constant support and encouragement throughout my study. You were there for me each low and high moment of the entire period of the study, thank you very much. To my parents, who always reminded and prayed for me to be strong and keep going when everything seemed to come to a standstill. I say, thank you very much. To my siblings Ruth, Mily, Eliza, Jacky and Peter for their constant encouragement and assistance in field work, I say thank you and God bless you.
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</tr>
</thead>
<tbody>
<tr>
<td>APU</td>
<td>Assessment of Performance Unit</td>
</tr>
<tr>
<td>EFA</td>
<td>Education for All</td>
</tr>
<tr>
<td>GER</td>
<td>Gross Enrolment Rate</td>
</tr>
<tr>
<td>HOD</td>
<td>Head of Department</td>
</tr>
<tr>
<td>KCPE</td>
<td>Kenya Certificate of Primary Education</td>
</tr>
<tr>
<td>KCSE</td>
<td>Kenya Certificate of Secondary Education</td>
</tr>
<tr>
<td>KIE</td>
<td>Kenya Institute of Education</td>
</tr>
<tr>
<td>KNEC</td>
<td>Kenya National Examinations Council</td>
</tr>
<tr>
<td>MOE</td>
<td>Ministry of Education</td>
</tr>
<tr>
<td>MOES&amp;T</td>
<td>Ministry of Education, Science and Technology</td>
</tr>
<tr>
<td>SMASSE</td>
<td>Strengthening Mathematics and Science in Secondary Education</td>
</tr>
<tr>
<td>SMT</td>
<td>Science Mathematics and Technology</td>
</tr>
<tr>
<td>SPSS</td>
<td>Statistical Package for Social Sciences</td>
</tr>
<tr>
<td>TSC</td>
<td>Teachers Service Commission</td>
</tr>
<tr>
<td>UNESCO</td>
<td>United Nation Educational, Scientific and Cultural Organisation</td>
</tr>
</tbody>
</table>
ABSTRACT

The study sought to investigate factors influencing girls’ enrolment and performance in physics in selected schools of Nandi South District, Kenya. Physics being an optional subject among the three science subjects (Biology, Chemistry and Physics), fewer girls opt for Physics as their subject of choice. The design of the study was descriptive survey and was carried out in seventeen secondary schools which were selected using stratified sampling. Data were collected from ten Heads of science Departments using interview schedule and from thirty physics teachers using questionnaire. More data were collected from 270 Form three physics students using questionnaire and achievement test. The data were analysed using both descriptive and inferential statistics. The data analysis revealed that school environment play a major role in performance and enrolment of girls in physics. It also found out that (70%) of the girls in the study passed the computational component of the achievement test, indicating that mathematical factor in physics had little influence on the performance of girls in physics. The study further revealed that (80%) of the parents greatly influenced the enrolment of girls in physics through the guidance and motivation that they provide to their daughters. The study recommends that parents and teachers be involved in the guidance of the girls in order to change the girls’ negative attitude towards Physics. The study also recommends in-cooperation of computational mathematics in the teaching of physics. Finally the study recommends provision of more gender-responsive resources for learning physics.
CHAPTER ONE

INTRODUCTION

1.0 Introduction to the Study

International reports, for example the Education for All (EFA) Global Monitoring Report (UNESCO, 2003) indicate that at the national level, Kenya has virtually attained gender parity in enrolment at both the primary and secondary education levels. However, close scrutiny reveals that serious gender disparities in enrolment exist between regions in favor of males with regard to access, retention, completion, performance and transition. The gap widens as one goes higher up the education ladder. In addition, it is evident that gender disparity is particularly large in access to and performance in Science Mathematics and Technology (SMT) subjects, (MOE, 2007).

In day-to-day life, we encounter energy and matter. The knowledge of matter and its interrelationship with energy is an important aspect of physics. All laws governing the structure of the universe and the behavior of particles in the universe are based on the relationship of matter and energy, which are studied in school physics, (Abbott, 1989).

The physics curriculum presents physics as a body of knowledge on the physical environment. It employs a scientific methodology of study to arouse learners’ way of reasoning and create positive attitude. It emphasizes not only the understanding of the fundamental scientific concept and principle, but also the experimental approach of investigation. Physics knowledge and skills are acquired through the scientific processes where the learner is required to come up with hypotheses, test the validity of the hypothesis through experiments or projects and make conclusions based on the results obtained.
This process requires the student to be precise and accurate. The insight acquired by the learner during the process of learning physics is the key to many aspects of life.

Learning physics is thus a critical and valuable undertaking which all secondary school level learners should be encouraged to experience in order for them to appreciate the relevance of physics in expanding their knowledge, values, and application of the required scientific knowledge in solving problems encountered in day-to-day experiences.

The evidence from other researchers indicates that there is a disparity in enrolment and performance of girls in Sciences particularly Physics (Amadalo, 1998; Kariuki, 2007; Twoli, 1986; Torongey, 1986). Such a disparity will affect the contribution of science in National development and the achievement of vision 2030 and millennium development goals in Kenya.

1.1 Background to the Study.

Education is widely recognized as key to national development. An increase in access and quality of education, relative to the national population, is critical to socio-economic growth and productivity, increase individual earnings and, subsequently reduced income inequalities and the reduction of poverty. It also contributes to improved health, enhanced democracy, good governance and effective leadership.

Since the attainment of political independence in 1963, the Government of Kenya has placed emphasis on the role of education in socio-economic and political development. Both the constitution of Kenya and the Session Paper on African Socialism and its Application to Planning in Kenya (1965) outlaw discrimination on the basis of gender and emphasize social justice and equal opportunities with regard to education.
There is adequate evidence that educating women is beneficial at national, community and individual levels. With even a basic education, individual women effectively engage in economic activities and thus contribute to greater national productivity.

Considering all the benefits of educating girls, Summers concludes that;

Investment in girls’ education may well be the highest Return on investment available in the developing world.


As a result, the Government of Kenya has considerably expanded access through opening of more secondary schools to increase accessibility and retention of girls in schools.

In spite of an overall increase in the enrolment of pupils in secondary schools due to the subsidized secondary education program, enrolment in physics is still low compared to the other two science subjects. The enrolment of girls in physics is far much lower than that of boys countrywide. In most cases, low grades of E and D characterize the national examination results in physics especially among the girls (KNEC Annual report, 2000). The poor performance in science subjects was echoed by the minister of education while releasing 2009 (KCSE) results:

Performance of science in (KCSE) is low compared to other Subjects in the curriculum. Minister of Education (2009).

Enrolment at the secondary education level has grown by 18.3% from 883390 students in 2003 to 1043467 in 2006 (MOEST, 2008). Despite the increase in overall enrolment of students, the enrolment of girls in physics subject is still low. At KCSE, Boys often tend to
perform better than girls in physics (Table 1.2); the performance of girls is still low despite of several interventions put towards increasing their enrolment and performance in science subjects through the Strengthening Mathematics and Science in Secondary Education (SMASSE) project in Kenya.

Table 1.1 National Enrolments of Girls in Science Subjects (2002-2010)

<table>
<thead>
<tr>
<th>Sub/Year</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics</td>
<td>15312</td>
<td>16094</td>
<td>16966</td>
<td>19288</td>
<td>21376</td>
<td>23767</td>
<td>25411</td>
<td>29233</td>
<td>29964</td>
</tr>
<tr>
<td>Biology</td>
<td>87141</td>
<td>91108</td>
<td>97641</td>
<td>113605</td>
<td>108065</td>
<td>118395</td>
<td>131681</td>
<td>143359</td>
<td>148729</td>
</tr>
<tr>
<td>Chemistry</td>
<td>87725</td>
<td>92615</td>
<td>99558</td>
<td>116826</td>
<td>111969</td>
<td>122532</td>
<td>143241</td>
<td>149755</td>
<td>155725</td>
</tr>
</tbody>
</table>

(Source: Annual Examination Report 2002-2010)

From Table 1.1, it is evident that physics enrolment nationally is still low compared to other science subjects (Chemistry and Biology) among learners across the whole country (KNEC Report 2009). The situation has not changed in the recent past, since few girls still enroll in Physics compared to other science subjects.

Table 1.2 National performance in science subjects (2002-2007)

<table>
<thead>
<tr>
<th>YEAR</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUBJECT</td>
<td>Total Enrolment</td>
<td>6</td>
<td>20773</td>
<td>22267</td>
<td>26066</td>
<td>24345</td>
</tr>
<tr>
<td>Physics</td>
<td>Girls mean score</td>
<td>26.61</td>
<td>29.09</td>
<td>31.41</td>
<td>32.85</td>
<td>39.07</td>
</tr>
<tr>
<td></td>
<td>Boys mean score</td>
<td>30.89</td>
<td>32.28</td>
<td>35.25</td>
<td>35.99</td>
<td>40.82</td>
</tr>
<tr>
<td>Chemistry</td>
<td>Girls mean score</td>
<td>22.05</td>
<td>24.04</td>
<td>25.76</td>
<td>24.54</td>
<td>22.56</td>
</tr>
<tr>
<td></td>
<td>Boys mean score</td>
<td>22.62</td>
<td>29.30</td>
<td>30.43</td>
<td>29.44</td>
<td>27.01</td>
</tr>
<tr>
<td>Biology</td>
<td>Girls mean score</td>
<td>24.58</td>
<td>27.23</td>
<td>32.91</td>
<td>27.24</td>
<td>25.00</td>
</tr>
<tr>
<td></td>
<td>Boys mean score</td>
<td>28.24</td>
<td>31.35</td>
<td>37.64</td>
<td>32.01</td>
<td>29.84</td>
</tr>
</tbody>
</table>

(Source; Annual Examination Report 2002-2007)
From Table 1.2, the girls mean score has been consistently lower as compared to boys mean score in all the three science subjects. This reveals a disparity in the performance of girls in physics subject.

### Table 1.3 Enrolments and Performance in Science Subjects, Nandi South District (2008-2010).

<table>
<thead>
<tr>
<th>Year</th>
<th>Subject</th>
<th>2008 Enrolment</th>
<th>Mean score</th>
<th>2009 Enrolment</th>
<th>Mean score</th>
<th>2010 Enrolment</th>
<th>Mean score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Physics</td>
<td>346</td>
<td>4.234</td>
<td>382</td>
<td>4.443</td>
<td>411</td>
<td>4.636</td>
</tr>
<tr>
<td></td>
<td>Chemistry</td>
<td>1256</td>
<td>4.023</td>
<td>1353</td>
<td>3.315</td>
<td>1395</td>
<td>4.435</td>
</tr>
<tr>
<td></td>
<td>Biology</td>
<td>1243</td>
<td>5.498</td>
<td>1247</td>
<td>4.659</td>
<td>1389</td>
<td>4.959</td>
</tr>
</tbody>
</table>

(Source: Nandi South District KCSE 2010 Results Analysis).

Physics enrolment in Nandi South District is still low compared to other two science subjects. In the year 2010 Physics had 29.4% enrolment, compared to 99% of Chemistry and Biology. Performance of Physics is also low compared to Biology. It is against this background that the study sought to investigate the low enrolment and poor performance in physics and particularly for girls in secondary school.

### 1.2 Statement of the Problem

This study sought to investigate the factors influencing enrolment and performance of girls in school physics. The study looked at the low enrolment of girls and their poor performance in school physics compared to the other two science subjects (KNEC 2007).

The trend in enrolment of the physics subject among the girls in secondary schools has been low compared to the overall enrolment of students in the secondary schools and despite the
low enrolment the performance of Physics is low compared to Biology. This puts physics at a disadvantage and at risk of not appealing to many girls due to its past poor performance record. The low enrolment and poor performance in physics among girls in secondary schools remain a challenge to both the education officers, parents, teachers and students.

The gap between the performance and enrolment in physics and other science subjects should be narrowed. (Kariuki, 2007) looked at the determinants of enrolment and performance in secondary school physics in general, but there has been no study in Kenya to examine into the factors influencing the enrolment and performance of physics among girls only.

It is under this consideration that the study investigated the factors influencing performance and enrolment of school physics among girls.

1.3 Purpose of the Study

The purpose of the study was to investigate the main factors influencing the low enrolment and poor performance of girls in school Physics in Nandi South District. High enrolment and good performance in physics by girls in secondary schools is critical in the elimination of gender disparities and enhancement of equal opportunities in education, the study investigated the main factors influencing enrolment and poor performance in physics by girls in secondary schools and came up with recommendations for interventions.
1.4 Objectives of the Study

This study was guided by the following objectives:

(1) To investigate the role played by the school’s teaching and learning environment in the performance and enrolment of girls in school physics.

(2) To investigate whether mathematical and spatial aspects in physics affect the enrolment and performance of girls in school physics.

(3) To establish whether the learner’s career choice and influence from parents and students affect enrolment and performance of girls in school physics.

1.5 Research questions

This study sought to answer the following questions:

(1) How does the school learning environment influence the girls’ enrolment and performance in school physics?
(2) Does the girls’ mathematical skill or spatial skills affect their enrolment and performance in physics?

(3) What role do the parents play in the performance and enrolment of girls in school physics?

(4) Is there a relationship between the teacher’s characteristics and the enrolment and performance of girls in school physics?

(5) What role do the peers play in the choice and performance of physics as a science subject?

1.6 Significance of the study

The study sought to investigate the factors influencing enrolment and performance of girls in physics. The study will be useful to the following:

Curriculum developers

The study findings will be useful to the curriculum developers like the Kenya Institute of Education (KIE) to institute changes in the curriculum that will help in improving the enrolment and performance of girls in school physics. The findings will also be useful to publishers on gender-responsive issues in the curriculum.

Examiners
The study findings will also be useful to the examination bodies like Kenya National Examination Council (KNEC) to come up with balanced assessments and evaluation. The policies formulated will improve the enrolment in physics.

**Teacher trainers**

Teacher trainers will find the results of the research beneficial in that they might disseminate the findings to the teacher trainees who will in turn use the skills to teach their students in their respective schools. These are teacher trainers in colleges and universities across the country.

**Quality assurance officers (physics)**

The physics quality assurance officers in the district may use the findings of the research to advise the teachers in the field about the low enrolment and poor performance of girls in school physics. The recommendations will be useful in monitoring the enrolment of students in science subjects.

**Physics teacher**

The results of the study will influence the teacher’s methodology in teaching. The study will be useful in determining the suitable strategies to employ in order to increase the enrolment of girls in physics. These will bring about improved academic performance and hence increased enrolment in school physics.

**1.7 Limitations of the study**
The study covered a small area and a small population of girls due to the researcher’s limited financial capability and time factor.

1.8 Assumptions of the study

The study assumed that:

(i) The girls and boys are taught by qualified teachers.

(ii) The respondents were honest.

(iii) Form three students have already formed stable attitudes towards science subjects.

1.9 Theoretical model.

The study was guided by constructivist theory of learning, where humans construct knowledge as opposed to the knowledge being transmitted into the mind. Jean Piaget, (1971) while contributing to constructivist theory of learning emphasized that learning and development is the role of other-peers and adults. In the construction of knowledge, peers and adults greatly influence learning and the acquisition of science concepts and major contribution to social interaction (Sternberg, 1995).

The study of physics starts from the basic ideas of what students understand or have experienced from their environments, when the student’s prior knowledge is used to build on other science concepts, then learner’s conceptualization of ideas increases and their performance in science subjects improves. The skilful teacher introduces new ideas and provides the support and guidance for students to make sense of these for themselves.
The study sought to find out the factors influencing low enrolment and poor performance of physics by girls in secondary schools hence the constructivist theory will guide the study in linking the perceived experiences by learners from the immediate school environment, their parents and peers to enrolment and performance in physics.

1.10 Conceptual model.

The conceptual model of the study illustrates the relationship between performance and enrolment to the within-school variables and out-of-school variables, which includes; teacher characteristics, learner aspirations, learner abilities in school and availability of teaching resources.

Fig.1.1 Conceptual Model of Enrolment and Performance in Physics.
The conceptual model indicates that the enrolment and performance in physics of girls could be due to among other factors, the role of the teacher and parents, girls’ motivation, mathematical and spatial skills and resources which determine learning activities in physics. The school environment may not be conducive for learning physics depending on the effort made by the school administrators to provide it. The provision of teaching and learning materials makes it easier for teacher to deliver the knowledge and skills in the teaching and learning environment. The school management is an intervening variable which is deemed a crucial factor in determining the variables used in the research. The study sought to establish whether these factors affect the performance and enrolment in school physics.

1.11 Definition of terms used in the study
**Elective Subjects:** Subjects that a student chooses from given number of choices.
They are not compulsory.

**Enrolment:** The number of students who opt to pursue Physics to KCSE level.

**Gender:** This refers to the socially determined power relations, roles, responsibilities and entitlements for men and women, girls and boys.

**Mock:** Trial examinations given to students before the KCSE exam.

**Performance:** These are the results obtained after carrying out examination of physics.

**Physics:** This is the study of matter in relationship to energy and laws that determines the structure of the universe.

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**CHAPTER TWO**

**REVIEW OF THE RELATED LITERATURE**

13
2.0 Introduction

This chapter gives a review of literature that provided insight into the conceptual framework of the study; the possible factors of poor performance and low enrolment among girls in secondary schools. The review of this study focused on selected factors that influence enrolment and performance.

Educationists and researchers have written a lot on factors that influence enrolment and performance and the topic of gender equity in the classroom; they tend to believe that gender balance is to pay more attention to the female students, by simply giving them more opportunities to participate in the learning process and to have their point of views heard, (Summers, 1992). Researchers have also written a lot on the factors that influence performance and enrolment in physics with an aim of improving the state of affairs (Mwangi 1983; Torongey 1986; Twoli 1986). Women and gender studies in education has taught us that our classrooms can be places of hostility to those who are at a disadvantage in the school population, (Kariuki, 2007).

The study sought to find out issues relating to poor performance and low enrolment in physics. This chapter reviews some of the literature based on the various studies carried out with an aim of providing an insight into the possible factors that influence performance and low enrolment of girls in physics subject.

2.1 Low Enrolment in Science Subjects

At the launch of 8-4-4 system at the secondary level of education, physics was compulsory for all. In 1992 it was made an elective subject and the students had to enroll for at least two of pure science subjects, or the Physical Science and Biological Science set of subjects (MOEST, 2000).
The Ministry of Education gave the policy presently in force, which requires students to choose at least two of the pure science subjects. The possibility of physics becoming appealing to students is low due to the past record of poor performance in the subject which translated to low enrolment by girls on physics related courses at the end of their four year course, (Jones and Wheatley, 1988).

Table 1.1 on KNEC (2002-2007) examination report, indicates candidate’s enrolment for physics (KCSE) being below that of Biology and Chemistry. The situation has not improved over the years despite all the intervention from education stakeholders especially for the girls who opt for physics. The numbers of girls who choose physics remains low.

2.2 Performance in Physics

According to Table 1.2 Performance in physics in the National examinations and schools’ examinations is a strong factor that will make physics subject appeal to most students, when the students perform well in physics it boosts their morale to undertake physics related career, however the performance of physics by girls in the national examination has not been impressive.

The poor performance in physics exams can be considered as a contributing factor in making the course to have little appeal to students interested in science, Indeed there has been a worldwide cry over learners viewing physics to be a difficult subject to be dropped as soon as possible, (Amadalo, 1998).

High school offers advanced mathematics classes that depend on the child’s ability to understand the basics in science. Biology, Chemistry and Physics all incorporate basic arithmetic’s and advanced laboratory-related calculations and this translates to the performance at the university. Among the sciences, physics is the most extreme in its male
dominance. In the 2001–2002 academic years, women earned 62% of U.S. bachelor’s degrees in Biology, 49% in Chemistry, 47% in Mathematics, but a mere 22% in Physics (Snyder, Tan, & Hoffman, 2004). The way science is practiced is largely a product of the way science has developed and since science was primarily developed by males, it is strongly enmeshed with practices that favor male success, (Hazari & Potvin, 2005).

From table 1.2 it is evident that the performance of physics in secondary school has been low since 2000 to 2005. There was a slight improvement in performance of physics in secondary schools between 2006 to 2010 National examinations.

### 2.3 Gender Differences in Physics.

Research on Gender and Education has focused on unearthing the underlying causes of gender disparities and factors that hinder attempts to reduce and eventually eliminate disparities. Studies reveal that key factors include social, cultural and religious beliefs, attitudes and practices, poverty, child labor, poor learning environment, lack of role models and learners’ attitude among others.

The national education system has been characterized by gender disparities at the national level and between the various regions in favor of males. Between 1999 and 2004 north eastern and coast provinces had gender disparities of over 10 percent, while central province had a gender disparity of only 2 percent. The widest gender gap exists at the higher education levels, despite the enrolment of females increasing by 48 percent between 1990 and 2000, in comparison to 27 percent for males. In 2004, female students made up of only 36 percent of those enrolled (MOEST, 2007). Gender disparities in performance in national examinations are also evident. In Kenya Certificate of Primary Education boys often outperform girls in all papers except English and Kiswahili compositions (MOEST, 2007). In the Kenya Certificate
of Secondary Education, boys tend to perform better in key subjects such as English, Mathematics, Biology, Physics and Chemistry. These disparities need to be addressed in order to achieve social equality and empower women, as there are obvious benefits that accrue from investing in educating women.

Performance and enrolment in physics is caused by among other factors, being unable to have well-developed manipulating skills good enough to handle practical examinations, (Thomas, 1990) when researching for girls in science and technology (GIST), found that boys persistently intimidated girls in science laboratory and denied them access to equipment. As a result, girls “loose out” in the use of apparatus and materials and hesitate to take risks that may seem dangerous with apparatus, (Twoli, 1986).

In analyzing performance in the KCPE and KCSE examination over a five-year period, Makau (1993) found that in the two examinations, the female performance was significantly poorer than that of male in humanities as well as science and mathematics. These findings raise questions. Are there in-built gender stereotypes in curriculum development and implementations which females find unattractive?

In the last two decades the narrowing of gender differences in achievements in science and languages in American schools has coincided with the growth of the movement towards equal opportunities among the two sexes. The movements strive to create equality and social-responsive actions on gender issues, (Sadker and Sadker, 1991).

Most research findings indicate that differences in achievement between boys and girls in science begins showing at secondary level especially at a defined age (Twoli, 1986). At primary level, most of science taught is much environment or general science hence does not bring in the demand for Higher Order Thinking Skills (HOTS). Male-female disparity in science achievements begins to surface at the upper primary school level and increases in
secondary school, and several factors curtails female participation in tertiary science and technology courses (Oburu, 1991). This begs the question. To what extent is this assertion justified? Does the learning experience of students within the secondary school not make a difference to their achievement at that level? In addition, this study implies that when choosing pedagogy, gender often matters. Pedagogy that works for one student may not work for another and traditional physics pedagogy has historically catered to the male majority. Pedagogy and curriculum further have the ability to reproduce the participants of a discipline by defining learning and knowledge that favor a particular group. In other words, physics learning and knowledge cannot be separated from the history, organization, composition, and the activities of the community itself (Nespor, 1994). However, this makes changing the physics curriculum, especially at the school level where we enter the realm of the physicist, increasingly complex.

The study critically analyzed the role of gender aspiration in the performance and enrolment of girls in physics. The disparities in the enrolment of physics in secondary schools and the influence on the overall performance of the subject will be analyzed in the study.

2.4 Physics Teacher Characteristics

Learning of physics is largely dependent on the role of the teacher as an instructor or facilitator. Compared to the significant influence of a good teacher, academic qualifications and systematic in-service training, the teacher’s age, sex and a pre-service professional training have only minimal influence on student achievement, (Nord & West, 1997). It appears that both male and female teachers fail to develop and use a mode of communication (evaluation of learning and interaction with students) which takes into account the special learning needs of female students. Sadker and Sadker (1991), observes that, as opposed to males, females tend to be less aggressive and assertive in asking and responding to questions, or expressing their views, or taking the lead in practical activities, they tend to be sidelined
and dismissed by the teacher, (with preference to male student) as lacking in ability. As a consequence, the full potential of most female students is not developed.

The low performance of girls in science in secondary education is the main causes of gender inequality in teacher education. For example, a laboratory exercise might be well designed and implemented such that it positively influences learning and later university performance just as a laboratory exercise can be poorly designed and implemented leaving students confused or having wasted time such that it negatively influences performance,(MOE, 2007).

Second, if pedagogy that is valued by many science teachers and education researchers, such as independent projects, does not lead to better performance, perhaps this is an indication of shortcomings in physics curriculum rather than with the implementation itself. In other words, perhaps the school physics curriculum is in need of serious instructional reform and traditional university physics is not the standard we should be preparing students for in high school. Thus, high school teachers have the onus of striking the balance between preparing their students for success in a university course as well as providing them with “good” physics instruction whether that instruction helps them in university or not. This issue stems from the often conflicting goals that teachers have to deal with of preparing future science students for university science and preparing future science students for everyday life and a lifelong appreciation for physics, (Hazari & potvin, 2005).

Perhaps, it is too much to ask teachers to juggle these goals without at least giving a critical look to reforming university curriculum so that it does not punish alternate forms of “good” instruction such as a humanistic approach that connects students to the concerns of everyday life and society (Aikenhead, 2005).

Of concern also is the current imbalance that has women teachers over-represented in many urban areas and under-represented in remote rural areas where their presence can encourage
girl’s education. There are efforts to deploy female teachers to rural areas and arid areas to be role models for girls and address the low representation of women in all levels, (MOE, 2007).

Science is about constructing meaning out of knowledge. It is not a simple matter for a teacher to ascertain whether or not a child has understood the concept, because the construction of knowledge comes about through the need to assimilate, translate and accommodate knowledge into various bodies of existing ideas, (Clark, 1972). Scientific claims do not depend on interpretation of events but also on our understanding of the concepts we use to describe the phenomena. For example, we would think that “sucking a drink up a straw is as a result of our own effort, rather than an effect of atmospheric pressure” these depends on both observation and interpretation and also understanding of the concepts like “atmospheric pressure”, (Kariuki, 2007).

The study sought to find out whether physics teachers make a deliberate effort to explain to girls each concept and fact in every statement before combining them to bring out a new meaning of knowledge. The study also sought to establish whether the teacher influences enrolment of girls in physics classes.

2.5 **Mathematical and Spatial aspects in physics**

The link between mathematics and physics is a strong one, (Hutchings, 1993). In fact, some topics in physics syllabus are similar to topics in mathematics school syllabus, for example, ‘waves’ in physics is similar to ‘Trigonometric graphs’ in mathematics. Studies which have examined factors influencing the learning of science in secondary schools suggest that mathematical ability is a significant component in the performance of physics. Mwangi, (1983) found out that the time students devoted to mathematics determines performance in mathematics and an improvement in physics.
These results are supported by the Assessment of Performance Unit (APU), findings in Britain. Using questions to test the ability such as use of graphs, calculations of gradients, tables and charts and working our averages of readings, it found out that at the age of 15 years, boys were showing significantly superior performance on Mathematics items.

In situations where a solution requires manipulation of objects, males overpower girls. When faced with a challenge, as opposed to girls, who in general are more likely to despair within a short period of time in the attempt, boys appear to be persistent on the task, (Twoli, 1986).

A number of researchers, for example Embeywa (1985) found that science students tend to treat mathematical relations as symmetric entities hence do not distinguish dependent from independent variables. The study sought to find out whether the mathematical and spatial aspects in physics hinder girls in performing well in physics and henceforth increasing their enrolment in physics.

2.6 Girls’ attitude towards physics

Studies indicate that girls have less interest in science than boys, (Coleman & Hobson, 1996). Many educators and researchers have addressed questions such as why girls in greater number than boys still study biology in preference to physics when there is an option.

Several Kenyan-based studies, (Eshiwani, 1984; Makau, 1994; Mwangi, 1983), suggest that teacher-induced female passiveness combines with student-induced female passiveness together with a negative attitude towards female participation in science and related careers, contributes to lower female performance in secondary learning examination. The early participation of girls in science activities contributes to enrolment of girls in science-based careers.
Boys often tend to perform generally better than girls in key subjects such as English, Mathematics, Biology, Physics and Chemistry. Although girls are regarded as more adept than boys in languages, this perception was debunked by performance in KCSE English between 2000 and 2005 when boy’s performance in the subject was superior to that of girls (MOEST, 2007). This has been internalized by both teachers, parents and the female students themselves, contributing to their negative attitude towards physics subject.

Teaching- learning transactions in the classroom is another contributing factor to the girls’ attitude towards physics. Current theories of learning hold the view that learning is an innate, active and constructive goal-oriented process which every individual is involved and in which the cognitive and emotive parts of the human brain are engaged in a complementary manner, (Anderson, 2007). Observations of formal lessons in schools suggest that, rather than guide the lesson on a process in which all students are actively involved, most teachers hijack the exercise and convert it into a one-way mechanical flow of knowledge from the teacher to the student, with most students playing a passive role; (Somerset, 1987).

The daily achievements of the students in class work boosts their confidence in handling science subjects especially the ‘hands on activities’ in the laboratory, (SMASSE, 2009). The study sought to find out the influence of girls’ negative attitude towards science on their performance and enrolment in physics.

### 2.7 School Learning and Teaching Environment.

School environment do impact on girls and boys, women and men differently. The critical gender issues in the school environment exist in the physical, academic and social dimensions
of the school. Research indicates that girls are more affected by poorly equipped environment, (Makau, 1994).

Provision of adequate, appropriate and gender-sensitive infrastructure is a major constraint to many school communities. In many schools, the problem results mainly from scarcity of resources and insensitivity to the needs of girls and women. This problem requires urgent attention as it affects the quality of education. In addition, if the working environment is not conducive the workers’ morale will be low and they will not deliver efficiently, (MOE, 2007).

It has been noted in several studies that, many so called within-school influencing factors are themselves influenced by out-of-school factors; the school needs proper support from macro socio-political system, the education system, parents and teachers, (Makau & Coumbe, 1994). Although it is recognized that support from without is an essential condition for an effective school, by using it does not guarantee high achievement among students. The literature on school effectiveness suggest that the within school factors, an enabling school environment and the appropriate teaching-learning system, must be present in order for students to do well.

An enabling school environment centers around the school head and the quality of their management, (Freeman, 2004). The achievement of female students in physics depends upon the formative characteristics of a good head, aspects of their professional management and administration and their relationships with the aspirations and expectations of learners.

The school has a greater responsibility of providing, conducive environment both in and out of the classroom for girls to compete favorably in learning science. To feel positively towards a subject area, one has to achieve highly in that subject. In that case, strong motivation orientation will be towards the subject area with high academic yields which is high performance.
In developing countries, the school is a much more powerful agent of change than is the case in developed countries, (Heyneman & Farrel, 1993). Linking achievements in schools to national level of economic development; Heyneman observes that;

*The poorer a nation, the greater is the influence on Academic performance of the school quality factors.*

(Heyneman & Farrel, 1993).

Thus, given the cited past research that supports these results and provided future research also supports these results, some suggestions can be made to high school physics teachers as avenues to try out in order to prepare students for university physics. These suggestions can also serve as research questions on pedagogy implementation that teachers and researchers can try to answer.

Also, since the suggestions do not take into account the important role that the pedagogies might play in terms of attitude and interest, further research is also necessary within that domain. Spend more time on less content (more time on mechanics and optics and physics history a recurring topic); that is, concentrate on understanding and on depth over breadth.

Increase frequency of physics-related videos but limit or reform implementation of Student - designed projects, reading and discussion of laboratory the day before performing them, microcomputer-based labs, and post demonstration discussions. Include problems requiring calculations on tests or quizzes.

The recommendations with regard to balancing gender differences (drawn from the intersection area of the male and female graphs) are; Have components that require students to have a deeper understanding of concepts. Although some memorization is acceptable, students should not rely largely on rote-learning strategies. One strategy might be to use many real-world examples, since real-world examples were highly correlated with conceptual understanding learning requirements.

Limit or reform long written problem usage and cumulative assessments (e.g., less
“Cramming,” more understanding). Again, the results of this study indicate that there are pedagogies and affective factors that might influence male and female students differently. Perhaps, this is part of the reason that single-sex education using reformed curricula and teachers trained to develop students’ self-concept has been so successful in improving female performance and persistence (Gillibrand et al., 1999; Haussler & Hoffmann, 2002; Parker & Rennie, 2002).

These reforms concentrate on the pedagogy and affective support that work for females. Single sex classrooms are one place where the results reported in this study could be further tested through implementation within actual classrooms. Females perform better in the “same old” physics courses perpetuates bias by trying to fit females into the “correct” mold. This is one important perspective. Another perspective is to recognize that similar to other disciplines, females are increasing in number and percentage in the field of physics as time progresses.

If helping them perform and stay interested at each stage can facilitate their entry into the field, then eventually they may be able to change the field from within as citizens of the field. This may be a more realistic approach than trying to reinvent the field from outside its borders. In a sense, this study is an attempt to facilitate the “border crossing” of females into the world of physics so that they do not enter into the domain as a lower class, at least in terms of performance,( Hazari & Potvin, 2005).

The next step is to ascertain high school physics and affective factors that influence female interest in physics as well as the factors that influence a female’s choice to pursue a physics or physics-related degree (e.g., engineering) in university.

2.8 Role of parents in promoting school learning
Okonkwo (1983) observes that parents discourage female students generally from studying science subjects which they stereotype as masculine and encourage them to study humanities instead. This only helps make worse an already bad situation in terms of science performance and enrolment.

Importance of a subject area to the child’s future as perceived by the parents may have profound implications. Perceived importance may directly affect the amount of encouragement a parent would provide to the child and the opportunities provided to the child that may be manifest in the type of activities, toys, and reading materials provided. As a child becomes older, importance is undoubtedly related to the belief of certain subject areas being important because they are important for future jobs.

Home practices based on sex roles, for example, cooking, washing, are routine roles and therefore they do not activate the cognitive structure of the girls at an early age and this process therefore make girls not to begin facing difficult cognitive situations like those found in learning science, (Kempa, 1986).

The activities that girls do from childhood disadvantage them as they do not ‘tinker’, (Twoli, 1986). It is this in mind that Iraki (1994) suggest that, the idea of car for boys and doll for girls should be discouraged. Girls should be given equal opportunities by parents to experience the ‘scientific activities’ that will boost their societal orientation towards science.

This appears to be limited in developing countries. But bigger challenges can mean bigger accomplishment and an increased level of confidence parents face a serious responsibility, but also a great opportunity in preparing their students for what lies ahead. Consider a mathematics and physics tutor or a computer-based program. In order to do well, they will need a solid understanding of the basics acquired in their grade school course. This was observed in America’s junior high school, (Hazari & Potvin, 2007).
2.9 Conclusion

The literature review indicates that, several studies carried out on performance and enrolment in school physics highlights the following:

a) There is a strong relationship between performance in mathematics and physics therefore learners should be encouraged to learn mathematics formulae so has to utilize the knowledge in physics.

b) Attitude towards physics is a major contributing factor in performance and enrolment of both boys and girls.

c) Teaching and learning resources are key determinants to teaching and learning of physics.

d) Creative and innovative teachers facilitate the learning of physics.

There has been no study in Kenya which focuses on factors influencing enrolment and performance of girls and this is a pioneer study. Other studies like (Kariuki, 2007) have looked at the factors of enrolment in general and used only questionnaires which could capture limited information. The study investigated the factors that influence low enrolment and poor performance among girls in secondary schools.

CHAPTER THREE
RESEARCH METHODOLOGY

3.0 Introduction

The chapter discusses the methods and description of the research design, target population, sample selection, instruments, administration of instruments, collection of data and data analysis. The research process indicates the conditions for collection and analysis of data in order to link it with the research purpose. It describes the methods and procedures for instrument administration, data collection and analysis of data that was obtained. The first section consists of the nature of the research samples including the method of its selection. The second section describes the research instruments that were used to collect data. The third section describes the methods and procedures for instrument administration and data collection while the fourth section describes the methods used in analysis of data obtained.

3.1 Research design

The research design that was used in the study was descriptive survey. The study aimed at collecting information from respondents on their opinion and attitudes in relation to the performance and enrolment of girls in physics. The survey design has advantages in research especially since it covers a large area and involves more respondents. The design and process of the study is summarized in figure 3.1 which shows the source of data, data collection procedures, data analysis, interpretation, summary, conclusion and recommendations.

Figure 3.1 Research design and process

Population: Secondary Schools
3.2 Location of the study
The study was carried out in Nandi South district, Kenya. Nandi South district was selected as the study site since it had a number of secondary schools, and most of the schools are accessible. The district had also mixed secondary schools, girls’ secondary schools and boys’ secondary schools offering physics as one of the examinable subjects. Lastly, the district was a familiar area to the researcher, a factor which facilitated the research process.

3.3 Target Population

Nandi South district has thirty five (35) secondary schools, with an estimated population of over 1600 students. The subjects of the study were drawn from some selected secondary schools in the district. The respondents included heads of science department, physics’ teachers and Form Three Physics’ students so as to make the study diverse and representative.

3.4 Sample selection

From Table 3.1, the research sample that was used in the study consists of seventeen (17) Nandi South district secondary schools. The selection of the sample schools was by stratified random sampling of both mixed secondary schools and girls’ only secondary schools because the researcher was interested in studying performance and enrolment of girls only. The high performing and low performing schools were selected through purposive sampling because there were few high performing schools in the district. The main focus was on physics students in Form Three class.
The rationale of selecting a stratified random sample of schools and the students is to ensure a clear variation of the independent variable in the various schools in order to find out major contributory factors to the dependent variables (performance and enrolment).

Table 3.1 Sampling Grid.

<table>
<thead>
<tr>
<th>Nature of Sec School</th>
<th>Number of Sampled Schools</th>
<th>Number Of Sampled Students</th>
<th>Number Of Sampled Physics Teachers</th>
<th>Number Of Sampled HOD’S Science</th>
</tr>
</thead>
<tbody>
<tr>
<td>Girls Schools</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H.P</td>
<td>5</td>
<td>70</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>L.P</td>
<td>5</td>
<td>70</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>Mixed Schools</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H.P</td>
<td>4</td>
<td>70</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>L.P</td>
<td>3</td>
<td>60</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>17</td>
<td>270</td>
<td>30</td>
<td>10</td>
</tr>
</tbody>
</table>

H.P—High performing school, L.P—Low performing schools.

Table 3.1 indicates that 17 schools were sampled through stratified random sampling method where schools from each category (Girls schools and mixed schools) were put in stratus and ten schools picked from a stratum of fifteen Girls schools category and seven schools picked from a stratum of ten mixed school category. The girls’ only schools had more physics students (averagely 30) per class while mixed schools had few physics students (average 20) per class in Form three classes, a total of 270 physics students were sampled. More girls’ schools were picked because the study focuses on girls studying physics. Three physic teacher and one HOD were picked from each school. This was done through purposive sampling, since the study focused on the performance in physics only.
3.5 Research instruments

The study used the following three research instruments to collect the required data:

1) Interview schedule
2) Questionnaires
3) Achievement test

The study used the three instruments in order to limit bias that can result from relying exclusively on one data source. The actual study involved the administration of the following instruments:

3.5.1 Oral Interview

The researcher conducted interview (Appendix 1) with the heads of departments of science. The purpose of the interview was to supplement the information that was obtained from questionnaires and achievement tests. The interviews were in form of discussions between the researcher and heads of department.

3.5.2 Teachers’ questionnaire

The teachers’ questionnaire (Appendix 2), were administered to physics teachers in order to obtain information on teachers’ characteristics and its role in enrolment and performance of girls in physics. Also to obtain information on teachers’ opinion regarding the computational skills of girls in physics examinations and its effect on enrolment.

3.5.3 Students’ questionnaire
The students’ questionnaires (Appendix 3), was administered to Form Three physics students of the selected schools in one stream. The questionnaires sought to find out:

(i) Attitude of girls towards school physics.

(ii) Teacher’s role in enhancing participation of girls in class work and practical work.

(iii) Influence from friends in the choice of science subjects.

(iv) Parents’ role in their career aspirations and expectations.

(v) Level of difficulty of the subject.

3.5.4 Achievement test

The achievement test (Appendix 4), was administered to Form Three physics students of the selected schools in one stream. The objective of the test was to obtain information on the following:

(i) Mathematical and spatial aspects in physics

(ii) Level of difficulty of the subject

The test was obtained from the year 2006 KCSE exam, which was already standardized.

3.6 Data Collection Procedure

The researcher personally administered the research instruments in each of the sampled schools, and personally carried out the interviews. The achievement test was administered to all selected Form Three physics students. The researcher sought the assistance of the physics
teachers so that the achievement test is done at the same time during the internal test time in some schools, and over the weekends for other schools.

3.7 Pilot Study

After designing the research instruments, the researcher conducted a pilot study in a mixed secondary school and girl’s only secondary schools in Nandi South district. The pilot study helped the study to determine the reliability of the research instruments and be able to correct any errors before the actual study was carried out.

3.7.1 Reliability

The reliability of the instruments was tested using the internal consistency technique, (Cronbach, 1960). The Cronbach coefficient alpha $\alpha$ will be computed from:

$$KR_{20} = \frac{K (S_b^2 - \sum S^2)}{S_b^2 (K - 1)}$$

Where:

$K=\text{no. Of items}$

$S_b^2=\text{variance of all items}$

$S^2=\text{variance of individual items}$

$KR_{20}=\text{Reliability coefficient}$

However, the researcher used the Statistical Package for Social Science (SPSS) to compute the Cronbach reliability coefficient alpha, $\alpha$. During piloting, the researcher discovered that some important questions in the questionnaires were missing, those questions were added after piloting had been done. Also it was discovered that, girls’ schools had more than one physics teacher due to the large number of students in the school, this was factored in when
administering the research instruments. The items with a value of 0.7 and above were accepted while the rest were reviewed to reach the level acquired.

3.8 Data analysis

The data that was obtained from the study was analyzed quantitatively using the percentages (%), means (x) and frequency distributions (f).

The student and teachers’ questionnaire items were analyzed on the frequency of each response. The test was analyzed using means while the interview was based on analysis and isolation of key important points. Most of the analysis was done using SPSS program.

3.9 Ethical Considerations

The information that was obtained from the research is kept confidential and used for academic purposes only. Before carrying out the research, a permit was obtained from the relevant authorities.
CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND INTERPRETATION.

4.0 Introduction

The chapter presents findings of the study which is discussed under five key thematic subsections in line with the study objectives. The discussion is preceded with a general section on socio-demographic attributes of the sample population studied. The thematic subsections included girls’ attributes, mathematical ability for girls, school environment and the role parents play in the performance and enrolment of physics in girls’ secondary schools in Nandi South County Kenya.

4.1 Socio-demographic characteristics of population surveyed.

This section discusses socio-demographic attributes of the population surveyed. It begins with questionnaires return rate, academic and professional qualification by gender. This is discussed under the following subheadings.

4.1.1 Questionnaires return rate by gender.

Questionnaires were distributed and collected from the respondents in the study area. Of the 300 questionnaires administered to the teachers and students, 300 (100%) was collected.
back. This proportion represents 30 teachers and 270 students. Other instruments used were the achievement test which captured all the 270 form three students and this recorded 100% return rate. Interview schedule was also used to capture opinions, feelings and attributes on departmental heads of about teaching of physics in school. Of the 10 HODs targeted, all turn up for interview and recorded 10(100%) thus, a total of 310 respondents participated in the study. This information is illustrated in table 4.1.

Table 4.1 Data collection instruments return rate by gender.

<table>
<thead>
<tr>
<th>Instruments</th>
<th>Gender</th>
<th>Distributed</th>
<th>Returned</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teachers</td>
<td>M</td>
<td>20</td>
<td>20</td>
<td>100</td>
</tr>
<tr>
<td>(Questionnaire)</td>
<td>F</td>
<td>10</td>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td>Learners</td>
<td>F</td>
<td>270</td>
<td>270</td>
<td>100</td>
</tr>
<tr>
<td>HOD</td>
<td>M</td>
<td>6</td>
<td>6</td>
<td>100</td>
</tr>
<tr>
<td>(Interview)</td>
<td>F</td>
<td>4</td>
<td>4</td>
<td>100</td>
</tr>
</tbody>
</table>

F – Female, M – Male.

Table 4.1 shows the delivery rate of instruments delivered from the respondents and the return rate it was collected back. High return rate on questionnaires indicated that, teachers and learners were readily available in schools since the survey was conducted during working days where almost 100% attendance was recorded. The interview conducted on HOD’s recorded 100% return rate due to the presence of the HOD’s in school at the time of interview. Achievement test administered to the students recorded 100% return rate, this resulted from prior sensitization by the teachers on the day of administration. Thus, a total of
270 students, 10 departmental heads and 30 teachers’ respondents were involved in this study which totals to 310 (100%) of target respondents.

4.1.2 Teachers Level of Education by Gender

Respondents (Teachers) who participated in the study were asked to state their educational level and their gender. Of the 30 teachers’ responses, 20(66.6%) were men and of these, 15 (75%) had graduate qualifications and 5(25%) had Diploma qualifications in education. However, the remaining 10(33%) represented females. Out of the 10 female respondents, 7(70%) had graduate status and the remaining 3(30%) had Diploma status in education and neither of them had certificate in education or Masters Degree qualifications. The information agrees with the Ministry of education gender policy study which revealed that between the year 2000 and 2006, the average enrolment of females was 49.6 percent in primary teacher education, 44.3 per cent in secondary teacher training colleges, 53.1 percent in special education teacher training program and 39.8 percent in public universities teacher education degree program. (MOEST, 2007). These translates to few females teachers teaching physics in secondary schools. This information is represented in table 4.2. This variety gave a useful blend for data.

<table>
<thead>
<tr>
<th>EDUCATION LEVEL</th>
<th>MALE</th>
<th>FEMALE</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diploma</td>
<td>7</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>Graduate</td>
<td>15</td>
<td>5</td>
<td>20</td>
</tr>
<tr>
<td>Total</td>
<td>22</td>
<td>8</td>
<td>30</td>
</tr>
</tbody>
</table>

Table 4.2. Teachers’ education level by gender.
The graph also indicates comparison based on gender in relation to the education level. The ratio of male teachers is significantly high as compared to females.

Figure 4.1: Teachers Education Level by Gender.

![Graph showing teachers education level by gender.]

Table 4.2 and figure 4.1 show respondents of physics teachers by gender and level of education is highly dominated by men which could reflect the imbalance in the subject at school level. The lack of female role models for the girls demoralizes them from enrolling in physics. On the other hand, there is high quality personnel for teaching of the subject since majority of the teachers are degree holders except few with Diploma and none with certificate.

4.2 Attitude of girls towards physics on enrolment and performance.

The study employed a student questionnaire as an instrument to determine the attitude the girls have on physics. This was done through stratified sampling of Form Three girls in all schools sampled for both low and high performing schools in the study area. Students’
attitude was tested in the questionnaires using items 16, 18, 20, and 29 (Appendix2). Of the 270 respondents among the girls, 216(80%) indicated to have developed negative attitude towards science based subjects particularly due to abstractness and difficult level involved. These resulted from the connotations stereotype attached on it where the subject is believed to belong to men and thus lowers the enthusiasm of girls’ performance and enrolment. Furthermore, respondents expressed opinion that, since physics was difficult and challenging subject, there was high chance of obtaining a lower grade.

Creative thinking has been instilled in learners through teachers’ initiatives. This is done through encouragement towards engagement of practical activities geared towards physics. Of the 270 students involved in the study, 189 (70%) strongly agreed that, the encouragement is received from teachers towards the subject, however 40(14.8%) indicated that it was their own initiative that spirited them in reading the subject, 20(7.4%) also pointed out that, neither of the parents nor teachers had influence and 4 (1.4%) never made any recommendation.

**Table 4.3 Support for girls by physics Teachers and parents on performance of physics.**

<table>
<thead>
<tr>
<th>Origin of the support</th>
<th>Frequency</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics teacher</td>
<td>189</td>
<td>70</td>
</tr>
<tr>
<td>Students themselves</td>
<td>40</td>
<td>14.8</td>
</tr>
<tr>
<td>Parents and teachers</td>
<td>20</td>
<td>7.4</td>
</tr>
<tr>
<td>Neither students nor themselves</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Totals</td>
<td>270</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 4.3, indicates that, much of the support students get towards physics comes from their teachers. Teachers of physics therefore play crucial role in developing girls in the learning of
However as opposed to outstanding performance of girls in languages, the performance of girls in physics is low since girls contribute to the negative attitude towards the subject, this agrees with the ministry of education gender policy, (MOE, 2007). The attitude towards a subject has a direct effect on the performance. Positive attitude can be associated with high performance while negative attitude is associated with poor performance in the subject, (Kariuki, 2007).

4.3 Teachers difficult level in teaching physics

The researcher further used interview schedule and questionnaire to source information from teachers on the difficulty levels in the teaching of the subject and challenging topics to handle. Out of the 30 teachers and 10 Head of departments inclusive, 21 (52.5%) indicated that most of the topics are easily handled, however, 5 (12.5%) indicated that some topics like electromagnetic induction, reflection, electronics and waves are challenged by students level of understanding and 14 (35%) never commented on the item. The subject difficulty level was determined from teachers’ questionnaire item 26, where teachers were required to respond to: if most topics in physics are difficult to handle. This was also linked to item 13 on the teachers’ perception on the overall performance of the girls in physics. Table 4.4 summarizes the findings.

<table>
<thead>
<tr>
<th>Topics</th>
<th>Percent (%)</th>
<th>Performance in class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electromagnetic induction</td>
<td>12.5%</td>
<td></td>
</tr>
<tr>
<td>Reflection</td>
<td>35%</td>
<td></td>
</tr>
<tr>
<td>Electronics</td>
<td>35%</td>
<td></td>
</tr>
<tr>
<td>Waves</td>
<td>35%</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td></td>
</tr>
</tbody>
</table>
Table 4.4, indicates that, teachers find all topics in physics easy to handle despite the negative attitude of students towards it. This could be as a result of high competency in training of teachers as indicated by high qualifications thus affect instruction in physics. Identified topics like electromagnetic induction, reflection and waves are only but some of the difficult to comprehend on the side of learners; however, these are said to be tackled by the most experienced teachers in schools. Furthermore, few teachers still believe that some topics are challenging to present especially mathematical part of it and it’s justified by the fact that mathematics appears to be challenging to learners.

Physics students work hard in class, the study established that 187(79.2%) of learners have shown high interest in studying the subject, and 20(7.4%) fairly work harder given that they’re very weak in mathematical skills. 63(23.3 %) do not work hard in the subject. This was done through questionnaire items 18, 25 and 29 on the student questionnaire. The study further established that, the indicated proportions results from motivational part of the subject when one excel in the subject, he or she qualifies for a marketable course like engineering course which has good remunerations (Mwangi, 1983). The handling of difficult topics in physics should be a collective responsibility of the parents, teacher’s learners and other education stakeholders. The difficult topics in physics can be handled through proper lesson delivery, better teaching method or strategy excellent evaluation policies and motivation of the learners, (Waititu, 2004).
4.4 Girls’ Performance in primary school science and physics in high school.

The study sought to investigate performance of girl students in primary school in relation to the performance of physics in high school. Through in-depth interview of students documents analysis (KCPE Certificate and End of term physics exam), out of the 270 girls who participated in the study, 239(88.8%) scored an average mark of above 50%, while 210(77%) of the same students had scored an average mark of above 50% in the End of Term physics Examination. 31(11.1%) scored a mark below average in KCPE examination, while 60(22.2%) of the same girls scored a mark below average in the school internal examination done previously before the research. Table 4.5 shows performance distribution of girls in primary school in relation to physics in secondary.

Table 4.5. Performance of science at primary school level and physics at high school.

<table>
<thead>
<tr>
<th>Grade obtained</th>
<th>Number of students who attained the grade in KCPE</th>
<th>High school(End of Term Exam)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>10 (3.7%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>B</td>
<td>50 (18.5%)</td>
<td>42 (15.5%)</td>
</tr>
</tbody>
</table>
According to the data, girls averagely performed well in science at KCPE, however performance in high school is skewed to the negative in high school, these results from teaching of science subjects in high school where science is taught as individual subjects: Chemistry, Physics and Biology. The study also confirmed that in primary school, as one of the students mentioned when asked about the relationship between science learnt in primary school and science learnt in the secondary school;

There is more of theory and cramming of scientific concepts rather than practice in primary school because of the absence of the laboratories. Form three students 28 (2012).

This was done through questionnaire item number 5 in the students’ questionnaires.

This occurs as a result of the absence of laboratories in primary and even apparatus to demonstrate scientific skills; the table furthermore has demonstrated straight comparison between what the learner got in KCPE and the current status in physics. Grades obtained, show that very little change has been realized, this could be resulting from the stereotype imaginations of complexity of the subject based on gender as indicated by (Amadalo, 1998).

**Figure 4.2. Performance of science at primary school level and performance of physics**
4.4.1 Students’ commitment to studying physics and performance.

The study sought to establish the effects of students’ commitment to physics studies and hence performance. Of the 270 students, 189 (70%) indicated a commitment to the studies on the subject. The questionnaire items 18, 27 and 28 sought to establish the commitment of students in studying physics and the commitment were reflected in the formation of study groups in the subject, science clubs and regular consultations with their physics teachers. Table 4.6 shows different level of commitment of students in different stations.

Table 4.6 Students’ commitment level in studying physics.

<table>
<thead>
<tr>
<th>Students commitment in physics</th>
<th>Frequency (%)</th>
<th>Performance in physics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students who study on their own initiative.</td>
<td>189 (70%)</td>
<td>B</td>
</tr>
<tr>
<td>Students who are guided by</td>
<td>27 (10%)</td>
<td>C</td>
</tr>
</tbody>
</table>
The table 4.7 shows that, many students have developed positive strategies towards studying physics as a subject. This was indicated by formation of study groups which engage in discussion and revisions of physics content. This reflects average performance of the subject. Furthermore, the positive attitude results from teachers’ initiative in guiding the students on the value of the subject and the impact it will create in life. 27(10%) of the population, represents a section of students who fully rely on the support of the subject teachers for guidance, hence perform averagely in the subject. On the other hand, 14 (5%) shows a section that is uncomfortable with the subject, however the efforts lies on the teachers initiative to ensure learners incline towards study habits on the subject to better the performance. Figure 4.3 shows the summary of the findings.

Figure 4.3 Student’ commitment to studying physics
This is in line with the feelings and views indicated by the HOD’s during the interview session on the student’s awareness of the job opportunities;

*Physics students should be aware of the job opportunities’ in line with the subject when they pursue for further education.* HOD science 8, (2012)

This encouragement and open awareness of the benefits they expect to gain has increased the number of students enrolling in physics class.

4.5. Role of the parents on enrolment and performance of physics in girls’ school.

The study was designed to establish the effect of parental influence on enrolment and performance of physics in girls’ schools. The study confirmed that parents play a vital role in the growth of enrolment. Out of the total girls questioned, 216(80%) indicated immense
support from parents in terms of material, morale and general guidance towards the subject (Table 4.6).

Table 4.7. Influence of parents on enrolment and performance of girls in physics.

<table>
<thead>
<tr>
<th>Influence by parents</th>
<th>Level of satisfaction</th>
<th>Implication on learning of physics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provision of laboratory equipment (PTA)</td>
<td>80%</td>
<td>Increases skill and competency in experiments</td>
</tr>
<tr>
<td>Morale support on selection of study subject.</td>
<td>80%</td>
<td>Confidence in lacking up the subject</td>
</tr>
<tr>
<td>Other needs</td>
<td>70%</td>
<td>Preparedness for learning</td>
</tr>
</tbody>
</table>

Table 4.7 shows the role played by parents on enrolment and performance of girls.

It is clear that parents contribute much support towards the subject performance through various ways. One outstanding contribution is by provision of laboratory equipments for practical work. It is commendable to see parents’ value practical skills in physics and science in general. Apart from laboratory materials, parents wish to see their daughters’ live successful life by getting a profession in science and they do this by giving the needed moral and material support for example, buying for them revision books. All these, encourages and boosts morale of girls to work hard in physics.

4.5.1 Relationship between content learnt in physics and daily experiences.

One interest in this study was to determine the relationship that exists between the content taught in physics and what the learner encounters in daily life experience. This was in line with establishing the learners’ interests in the subject and their career choice. Of the 270 girls
given the questionnaires, 185 (68.5%) indicated to have encountered and even applied knowledge gained from physics in school. The content areas commonly mentioned to have been encountered were liquids and making work easier. Of the 270 girls 54(20%) indicated to have hardly experienced relationship between the content taught and encounters in real life (Table 4.8).

Table 4.8. Relationship between content learnt in physics and daily experiences.

<table>
<thead>
<tr>
<th>Content learnt in physics</th>
<th>Where applied in life</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behavior of liquids</td>
<td>Use of fluids</td>
<td>185(68.5%)</td>
</tr>
<tr>
<td>Machines</td>
<td>Use of simple machines to make work easier</td>
<td>18(6.6%)</td>
</tr>
<tr>
<td>Reflection of light using plane surface e.g. mirror</td>
<td>Application of mirrors in beauty cafes and side mirrors</td>
<td>13(4.8%)</td>
</tr>
</tbody>
</table>

4.5.2. Family Influence on choice of career and performance in physics of girls in high school.

The study aimed to establish the family influence on choice of career and performance of girls in the subject in secondary school. Out of the 270 girls who answered question on items 8, 9 and 19 (Appendix 3), 179(66.2%) indicated that parents had immense influence on career choice that focuses on science subjects in school. The other population 58(21%) indicated that, career choices were guided by teachers and 33(12%) indicated having made choices individually without guidance from any one. (Table 4.9).
Table 4.9 Family influence on career choice and effects on performance

<table>
<thead>
<tr>
<th>Response from students</th>
<th>Frequency</th>
<th>Effects on performance of physics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Choice of career is by parents</td>
<td>179(66.4%)</td>
<td>Average performance</td>
</tr>
<tr>
<td>Choice is guided by teachers</td>
<td>58(21%)</td>
<td>High performance</td>
</tr>
<tr>
<td>Choice is done individually</td>
<td>33(12%)</td>
<td>Slightly below average</td>
</tr>
</tbody>
</table>

This indicates that most parents greatly influence the career choice of their daughters and therefore encourage them to pursue subjects that are related to their career choices. This influences the enrolment and performance of girls in physics subject. One student whose career choice was to be a medical doctor mentioned that:

_My father urged me to study sciences and become a doctor, so could Help him through his old age._ Form three physics student 113 (2012).

Table 4.9, indicates that, career choices are not only made by respective parents of students but also it is pegged on science oriented subjects and the influence of teachers and students themselves. As high portion 179(66.4%) represents choices made by parents, it has not added value to the performance of the physics in the examination as most affected learners get average scores as compared to those who get an expert opinion from teachers who handle the subject, and consequently, performance are above average. However, there is also a portion 33(12%) which has never consulted either parents or teachers over career choices in line with the study of physics as a subject and performance indicated shows low scores that lack motivational from the stakeholders. In depth interview from head of science departments revealed that, career guidance sessions are conducted for both science and humanity oriented jobs opportunities. By doing so, it has increased the morale of science students since right role models are used as an example to shape and model students to choose the job
opportunities appropriately. Engineering course in any field is the most admired course by science students and it is tied on good performance in physics and other related subjects. It has attracted most students due to good returns in terms of monetary gains, publicity and perception of high intelligence. Importance of a subject area to the child’s future as perceived by the parents may have profound implications. Perceived importance may directly affect the amount of encouragement a parent would provide to the child and the opportunities thereafter (Kempa, 1986).

4.5.3 Peer influence on subject choice and performance of physics in girls’ schools.

The study sought to establish whether peer influence played a role in the choice of physics as a science subject by students in Form Three and whether the choice of physics go towards improving enrolment of girls in physics subject. Items 17 and 21 (Appendix 2) requiring them to state whether the classmates influenced them to choose physics was put in the students’ questionnaire.

Those students who Agreed (A) and Strongly Agreed (SA) to the item were deemed to have been influenced by their peers in choosing physics and those who were Neutral or Strongly Disagreed (SD) were taken to have chosen physics on their own initiative. Out of the 270 girls presented with the questionnaires, 102 (37.8%) strongly agreed that peers had a great influence on the choice of physics as science subject, 30 (11.1%) agreed, while 18 (6.7%) could not either agree or disagree and 12 (4.4%) disagreed that peers had an influence on the choice of the science subjects while 108 (40%) strongly disagreed. (Table 4.10).

**Table 4.10. Peer influence on the choice of physics and performance**

<table>
<thead>
<tr>
<th>Response from students</th>
<th>Frequency</th>
<th>Effects on performance of physics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Choice of physics is by peers</td>
<td>132(48.8%)</td>
<td>Average performance</td>
</tr>
</tbody>
</table>

51
The influence of peers on the choice of physics subject in secondary schools directly influences the career choice of the students after the National examination (KCSE). The study sought to establish the influence peers had on the choice of physics subject in order to link it to the career choice of the students. The study findings indicate that, those students with self initiative on the selection of the subjects perform well in the internal examinations done in the schools. Also the students who are influenced by the peers perform highly in their examinations. This leads to a choice of science related course and career.

4.6 Mathematical and spatial aspects in physics performance.

The study sought to establish influence of mathematical aspect in physics on performance of girls in physics. This was done through administration of achievement test which had mathematics questions, items 2, 4, 5, 9 and 10a (Appendix 4) in the students’ achievement test, five of the ten questions asked in the test had mathematics calculations. Out of the maximum score of 25 marks in the five questions asked, 108(40%) students scored a mean of 17.5 marks, (Appendix 5). Of the 270 students who sat for the test, 108(40%) successfully passed the test with above 60% and this indicated high ability level; 81(30%) averagely performed well with a score of between 40%-60%, 54(20%) had between 20-40% and the last 27(10%) had below 20% score. This is represented in table 4.9.

Table 4.11. Mathematical ability test results in physics on learners’ performance.

<table>
<thead>
<tr>
<th>Number students</th>
<th>Frequency (%)</th>
<th>Ability level (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>72</td>
<td>26.6%</td>
<td>70</td>
</tr>
<tr>
<td>36</td>
<td>13.3%</td>
<td>60-70</td>
</tr>
<tr>
<td>----</td>
<td>-------</td>
<td>--------</td>
</tr>
<tr>
<td>81</td>
<td>30%</td>
<td>50-60</td>
</tr>
<tr>
<td>40</td>
<td>14.8%</td>
<td>40-50</td>
</tr>
<tr>
<td>14</td>
<td>05.5%</td>
<td>30-40</td>
</tr>
<tr>
<td>15</td>
<td>06.1%</td>
<td>20-30</td>
</tr>
<tr>
<td>12</td>
<td>04.6%</td>
<td>Below 20</td>
</tr>
</tbody>
</table>

The table 4.11 reflects the mathematical ability level of students studying physics in high school. A proportion of 189 (70%) indicate that, the girls enrolled in the class of physics have high mathematics computation skills to assist them to apply in solving physics problems. This could be one strong point why they have chosen physics as a subject since most questions in physics examination contain mathematics concepts.

4.6.1 HOD’S views on mathematical ability level of girls in physics.

The study intended to establish HOD’s views on mathematical ability level of girls in physics. The tool used to capture their evaluation was on interview schedule. HOD’s suggested that mathematical ability in physics is based on background knowledge of learners in mathematics. This is reflected on the enrolment in physics class where those with high mathematical computation skills go for physics option. Of the 10(100%) HOD’s interview, all of them indicated that, students with high computation skills in mathematics perform relatively high in physics. (This is witnessed from previous examinations recorded showing high scores, for example the end of term exam). Furthermore physics teachers play a crucial role in molding and encouraging learners in active participation in actual calculation related to physics. This is done through physics study groups, science clubs and science congress. Mathematics department has also been brought on board to assist in teaching of basics in
mathematics which are cross-cutting to other related subjects. As reported by one of the, HOD’s, in response to item 18 (Appendix 1), who stated that;

*As a result of vital role played by mathematics factor in learning physics, most of the physics teachers also teach mathematics, hence it has been made easier to bring competency in mathematics abilities.* HOD science 7 (2012).

### 4.7 Learning environment on performance of learners in physics in girl’s schools.

The study was designed to investigate whether or not a learning environment influence performance of learners in girls’ schools. An environment was considered as facilities in the school that necessitated learning of physics and performance. The study employed questionnaires for learners and teachers to find out their views on adequacy of facilities like text books and laboratory. It also used an achievement test to establish the learners’ ability to tackle physics tasks. An interview schedule was used for HOD’s to get their views and opinions on the performance of the subject in relation to the environment. Of the 270 respondents interacted with, 248 (92%) students expressed that environment has great influence on teaching and learning of physics in their school. This was done through questionnaire items 14 and 15 (Appendix 3). Of the 30 teachers involved in the study, 26(86.6%) of the teachers responses indicate that, environment play an important role in teaching and learning. The response was in line with questionnaire items 16 and 24 (Appendix 2). 9(98%) of the HOD’s interviewed agree that the provision of teaching and learning facilities improves the performance and enrolment in the subject. This was in line with interview question item 11, 12 and 20 (Appendix 1). This concurs with the Government policy on education of the girl child. Provision of adequate, appropriate and gender-sensitive infrastructure is a major constraint to many school communities. In many schools, the
problem results mainly from scarcity of resources and insensitivity to the needs of girls and women. (MOE, 2007).

Table 4.12 Environment and performance of physics in girls’ high school.

<table>
<thead>
<tr>
<th>Learning environment</th>
<th>State of the environment</th>
<th>Rating of the environment</th>
<th>Effect on performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic and Technical staff</td>
<td>Adequate</td>
<td>71%</td>
<td>High quality work</td>
</tr>
<tr>
<td>Learning rooms</td>
<td>Adequate</td>
<td>76%</td>
<td>High performance</td>
</tr>
<tr>
<td>Laboratories</td>
<td>Not adequate</td>
<td>34%</td>
<td>No practical lessons</td>
</tr>
<tr>
<td>Libraries</td>
<td>Not adequate</td>
<td>28%</td>
<td>Low performance</td>
</tr>
<tr>
<td>Text books</td>
<td>Average</td>
<td>53%</td>
<td>Average</td>
</tr>
</tbody>
</table>

The table 4.12 shows the effects of the availability of facilities in the teaching and learning environment. Adequate qualified staff for handling physics, indicate skilled and quality work that boost performance in a subject. Teaching and learning rooms have also been rated high, since most schools have classrooms where lessons are conducted. It is due to adequate learning facilities that have guaranteed quality learning. The availability of laboratories was rated low 92(34%) due to less practice on practical lessons gained from theory lessons thus lowers performance. Absence of libraries for reading and other reference materials was also rated low due to none existence of books as compared to high enrolment of students in
schools. However teachers were rated average due to their professional outlook, moral support and guidance towards high performance in the subject. Figure 4.7 shows the ratings of the facilities in school by the students.

**Figure 4.4. The rating of the Learning Environment.**

![Learning Environment Ratings Diagram](image)

### 4.8 Head of departments response on learning environment and learners performance of physics in high school.

The study targeted responses from head of physics department in schools. All HOD’s interviewed 10(100%), confirmed that environment played part in the growth and performance of physics in girls’ schools. As they revealed that, improved interpersonal relationship between students and teachers restore confidence in students and thus boosts morale and standards of the subjects.
Table 4.13. Departmental heads analysis on environment and performance of physics in girls’ schools.

<table>
<thead>
<tr>
<th>EFFECT</th>
<th>TARGET</th>
<th>IMPACT ON LEARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insecurity</td>
<td>Teachers and learners</td>
<td>Anxiety leading to lack of concentration.</td>
</tr>
<tr>
<td>Unskilled man power</td>
<td>Teachers</td>
<td>Inferiority that leads to poor content delivery and use of lab tools.</td>
</tr>
<tr>
<td>Lack of motivation</td>
<td>Learners and teachers</td>
<td>Low morale, despair and eventually lower performance.</td>
</tr>
</tbody>
</table>

Table 4.13, shows various effects on the teaching and learning environment that affect performance of physics in girl’s school. Insecurity in the teaching and learning environment makes it impossible for teachers to comfortably come to school and prepare for the lessons. Lack of trained personnel also leads to incompetency and poor content delivery and this impact on the performance. Motivation was also considered to be an intriguing factor in the performance of the subject. This was adversely mentioned on the side of teachers and highly on learners. HOD’s expressed feelings that science teachers, more so physics teachers should be motivated for the hard work they perform in order to boost the morale of teachers.

4.8.1 Teachers’ and HOD’s views on physics workload on performance.
The study was designed to analyze the intensity of workload of teachers on performance of physics in girls’ high school. Teachers and HOD’s were given chance to comment on effect and the magnitude of the influence on overloaded physics teachers against performance. Out of the 30 teachers given the questionnaires 24 (80%) indicated that workload in physics is enormous. As quoted from one teacher’s interaction, who stated;

*I teach all physics lessons in the entire school and am supposed to prepare lesson plans and schemes of work, this does not give me adequate time to interact with the learners and give them individual attention required.*

Physics teacher 17 (2012).

This results from TSCs’ delayed employment and posting enough physics teachers in high schools. In response to interview question item 8 and 20, the HOD’s science expressed their dissatisfaction in the coverage of syllabus and they attributed it to large workload.
CHAPTER FIVE

SUMMARY OF STUDY FINDINGS, CONCLUSIONS AND RECOMMENDATIONS.

5.0 Introduction

The section presents summary of key study findings, the conclusion and recommendations which are logically arranged in line with the objectives of the study.

5.1. Summary of the study findings.

The main findings of the study is that there are factors which influence enrolment and performance in physics among girls in secondary schools, but very little has been done on the management of these factors to bring about high enrolment and performance of the subject. The influence is highly felt on the attitude of girls towards physics as a subject. Girls have a formed opinion on the nature of the subject, majorly on difficulty level and having mathematical elements which scares them off. Of the 270 girls who participated in the study, 216(80%) had the opinion that hard subjects are comfortably done by men since such subjects leads to masculine jobs or careers which are better done by men. In-depth interview further revealed that, much of the encouragement and change of mind towards the subject has been done through parents and teachers. Teachers do these through open forums, talent days and lectures on career selection and job markets available nationally and globally. Attitude has been approached in two ways; focusing on pupils’ perception on the subject and teachers’ perception on the subject. Even though the subject appears to be challenging to learners, teachers indicated having negative attitude towards certain topics that appears challenging to
them and thus to some extent spill over to the learners and hence lowers performance and enrolment in the subject.

Document analysis (KCPE results) further revealed that learner’s background in science at primary level was a bit weak as grades were averagely of a “C” 216(80%). This resulted from inadequacy of laboratories for practical lessons and lack of science teachers who have specialty in physics.

In restoring confidence in learners’ towards studying physics, it was confirmed that parents play vital role in guiding and counseling learners on study habits, career opportunities and selection of subjects. These were done through resource mobilization in order to build more learning rooms and morale building. Study content in physics had close relation with what learners encounter in real life situation. This is realized when students transfer knowledge learnt in class to solve other related problems in life for instance use of machines to make work easier, behavior of liquids, reflection of light “mirrors”, transfer of heat and communication use of ‘mobile phones’.

Environment has also played a vital role in shaping performance and enrolment of physics in girls’ schools. Presence of laboratories and well stocked libraries increases performance and high enrolment of learners in physics class.

5.1.1 Attitude towards physics on enrolment and performance.

Generally, there is evidence that students in the study schools, have negative attitude towards studying physics in the syllabus as indicated by 216(80%) of the number involved in the study, enrolment of students has been low compared to that in other science subjects: Chemistry and Biology. Close analysis of the questionnaires given to teachers, HOD’s and students revealed that girls based the argument on the premise that physics is meant for men.
5.1.2 Relationship between content learnt and daily experience of physics students.

The study revealed that there is a relationship between the knowledge learnt in classrooms and the impact it has on the daily experiences of the learners when the same knowledge is transferred. Of the 270 girls interviewed 189(70%) indicated to transfer and apply knowledge in the daily experiences and problem solving in different scope of life. Use of electronic appliances, machines for making work easier is an appreciation of physics in practice and thus increases morale and seriousness of learners in studying the subject. Another area where the subject has been applied successfully is on reflection of light where the technology of mirrors arises and this is applied in fiber optics, boutiques, beauty café and home dressing especially for girls.

5.1.3 Mathematical aspects in physics on performance of physics.

The study on mathematical computation skills on learners’ performance revealed that, learners have high mathematical skill. This was revealed from achievement test administered to all form three students whose majority 108(40%) scored a mean score of 17.5 which represent 70% pass, with few 81(30%) scoring below 50% marks (Appendix 4).

The results indicates that, there is a paradigm shift from the tradition approaches of teaching mathematics concepts in physics to the current method where learners are exposed to hands on and minds on activities that allows the learners to explore and discover new ideas in the subject, (SMASSE, 2009). Also competency of teachers and commitment to their work is one of the factors that have led to improved performance in mathematical part of physics content.
5.1.4 Influence of learning environment on performance of physics in girls’ school.

The study aimed at testing whether or not environment has influence on performance and enrolment of physics in girls’ schools. The study findings from the interviews and questionnaires administered, indicated that environment has great effect on the overall outcome of the school performance and enrolment. Of the 270 girls interviewed 248 (91%) expressed feelings that unfavorable environment inhibits learning and reduces the number of students enrolling for the subject. Some of the unfavorable conditions included absence of science laboratories, libraries and generally good working environment that guarantees security and boost morale of students and teachers for better results.

5.2. Conclusions.

The study concludes that there exist critical barriers to the performance and enrolment in physics in girl’s school. This is largely attributed to numerous weakness pointed out in the management of education systems in girls secondary schools both locally and nationally. Some of the barriers include:

(a) The girl’s attitude towards physics. The negative attitude of girls makes them perform poorly in physics. The girls should be sensitized so as to change beliefs and attitudes about females’ ability in physics and be encouraged to voluntarily develop a positive attitude towards the subject.

(b) The mathematical part in physics impact on girl’s performance in physics. The learners should be encouraged to practice mathematics more often and mathematics teachers should be involved in teaching of mathematics concepts in physics.
Parents and peers influence enrolment of girls in physics hence the need to build girls confidence in science through implementation of programmers such as mentorship, role modeling, science camps or clinics and career guidance.

The school environment plays a major role in the enrolment of girls in physics. The school administration should increase access to gender-responsive science facilities, equipments and textbooks.

Girl’s attitude towards physics, mathematical skill, school environment and role of parents, influence the performance and enrolment of physics in girls’ schools. However, all the said challenges can be addressed through proper management of the girl’s education. This can be done through participation of girls in decision making in the schools, sensitization of stakeholders, identification of needs in the subject area to suit the learners’ needs and learners to voluntarily develop positive attitudes towards the subject.

5.3. Recommendations

The study makes the following recommendation that will address short, medium and long term needs on the teaching of the subject in girl’s schools to bring about improved performance and enrolment in physics.

5.3.1 Recommendation for Action.

(a) Attitude on enrolment and performance of physics in girls’ school.

To change the negative attitude, girls should be guided and sensitized on the benefits of studying the subject in line with the job market and in relation to well paying jobs in the society. Negative attitude can also be demystified through proper teaching and presenting of
subject matter where learners enjoy and get the most simplified content that is easily comprehended. Open forums should be emphasized between students and physics teachers on challenging issues pertaining the subject and design a joint way forward for success of the students.

(b) Mathematical aspect on enrolment and performance physics in girls’ school.

To improve mathematical skills of learners, teachers should jointly address the issues through incorporating mathematics teachers in laying strong foundation in acquisition of mathematics basics that will be applied in physics. Selection of physics students should be based on strong mathematical background way back to primary and general performance in previous years in secondary. The government also to post more qualified mathematics and physics teachers in girls to addressed numeracy in physics.

(c) Environment on enrolment and performance of physics in girls’ school

To improve learning environment, the government should fund construction and installation of laboratory facilities for proper learning and carrying out of practical lessons in physics. In line with this, the government is charged on proper installation of libraries with relevant reference books for the school especially physics. School administration should avail learning rooms, furniture and generally provide safe and enabling environment for both teachers and students.

(d) Role of parents on enrolment and performance of physics in girl schools.

For parents to be seen playing part in performance of physics in girls schools, School management should involve them in serious decision making especially on cluster placement and be sensitized on the role to play in molding girls to the scientific world. Parents to take up their responsibilities on their daughter’s studies at home by encouraging and inculcating reading culture on science subjects to bring about good performance in physics and
encourage them compete favorably with boys by taking up physics as a science subject. The parents can also provide basic requirements for the girls in terms of physics revision materials and textbooks.

5.3.2 Recommendations for Further Research.

1. Researchers should conduct a survey on the enrolment of girls in science based courses at the university and college level.

2. A similar study could be carried out in other districts in Kenya to establish whether or not the findings of this study apply to other regions.

REFERENCES


University.


**APPENDIX 1**

**HEADS OF DEPARTMENTS INTERVIEW GUIDE**

SCHOOL...................................................................................................................................

POSITION HELD IN SCHOOL...........................................................................................................

NUMBER OF YEARS IN TEACHING..............................................................................................

1. Do you make students aware of job opportunities that are there when they learn physics?

2. Do you stream students according to ability or is it random streaming?

3. How do students select their science subjects?

4. How is the attitude of students towards physics in the school?

5. What is done to change the attitude of the students?
6. Are students encouraged to think logically during physics learning and how is it done?

7. Are students assisted to view the relevance of the physics learned in class in relation to what they come across in society and career opportunities?

8. How often do you check students work in relation to syllabus coverage?

9. What is the evaluation policy of your school’s science department?

10. How is the evaluation done?

11. Are revision and reference materials available and enough in your school?

12. How many laboratories do you have in your school for teaching of physics?

13. Do you choose those students you want to do physics or students choose subjects themselves?

14. How do you ensure that all the students participate in practical activities?

15. Are students encouraged to design investigations aimed at solving problems in physics?

16. Are parents involved in the subject choice of their children?

17. How often do you talk to the science students?

18. Are students encouraged to take a keen interest in other science subjects and mathematics?

19. Are students taken out for field trips, symposium or contest?

20. How can the performance and enrolment of physics be improved in your school?

APPENDIX 2

Teachers’ Questionnaire

Dear physics teacher,
I am interested in finding out the factors influencing performance and enrolment of physics among girls in secondary schools. Please give honest information as possible. The information you give will be treated as very confidential between you and the researcher.

**General Information**

Name of School........................................................................................................................................

Sex (male or female)................................................................................................................................

Teaching subjects....................................................................................................................................

Number of years in teaching...................................................................................................................

**INSTRUCTIONS:**

1. Please read through the instructions very carefully first before you start answering the questions.

2. For the boxed questions (A. B. C. D. E.) indicate your response by ticks in the appropriate boxes.

3. The questions with spaces to be filled should be answered in the spaces provided below the statement.

4. The information you will give will help improve physics enrolment and performance in the district; if the results are honest, complete and trustworthy.

**Teachers’ questionnaire**

**Section A: Tick (√) the appropriate box.**

1. What is the highest level of your education?

2. What is the highest level of your education?
2. What is your professional qualification?
   (a) Graduate teacher
   (b) Diploma
   (c) Approved teacher
   (d) Untrained teacher
   (e) Teacher certificate

3. When last did you undergo in-service training in physics?
   (a) More than 10 years ago
   (b) More than 5 years ago
   (c) Three years ago
   (d) One year ago

4. When did quality assurance officers visit your school last?
   (a) Over 20 years
   (b) 20-15 years ago
   (c) 15-10 years ago
   (d) 5-10 years ago
   (e) 5-0 years ago
5. Do you normally prepare schemes of work?
   Yes []  No []

6. If you do not have a scheme of work, please kindly explain how you plan your teaching activities.

7. Do the students select science subject on their own?
   Yes []  No []

8. If not, kindly explain how you select the physics students to your class.

9. Averagely, how many physics students do you have in form three classes?
   (a) More than 50 []
   (b) 50-40 []
   (c) 40-30 []
   (d) 30-20 []
   (e) 20-10 []

10. How many lessons do you have in a week and do you attend all?

11. Does your workload enable you to attend to individual students?

12. Are the resources for teaching, effective in teaching of physics in your school?

13. How do you rate your school’s performance in physics?
   (a) Excellent []
   (b) Very good []
14. How do you rate your school’s enrolment in physics?

(a) Very satisfactory
(b) Satisfactory
(c) Not satisfactory
(d) Poor

Give three reasons for your answer

1........................................................................................................................................
............................................................................................
2........................................................................................................................................
.........................................................................................
3........................................................................................................................................
...........................................................................................

Section B: Tick (√) in appropriate box using the following information

In the choices,

SA  Stands for Strongly Agree
A   Stands for Agree
N   Stands for Neutral
D   Stands for Disagree
SD  Stands for Strong Disagree

15  the student’s parents support their students to perform well in physics
16. The school provides an environment which is conducive for the girls to perform well in physics?

17. The students our school admits are below average and cannot pass well in physics

18. Students are encouraged to think creatively during learning sessions

19. Students are helped to make precise and accurate observations during physics practical sessions

21. Our students are lazy and do not like working hard

22. My day’s workload cannot allow me to attend to physics slow learners

23. The enrolment of physics by girls in form three is influenced by their parents/guardians

24. The school provides all the required apparatus and equipments for practical lessons in physics
25. I rejoice when I complete the physics syllabus

26. Most of the physics topics are difficult to handle

27. Learners are encouraged to verify their predictions by doing experiments that are based on scientific idea and relate to environment

Thank you for your cooperation.

APPENDIX 3

Student’s Questionnaire

Dear student,

I am interested in finding out the factors influencing performance and enrolment of physics among girls in secondary schools. Please give honest information as possible. The information you give will be treated as very confidential between you and the researcher.

General Information

Name of the school..................................................................................................................................................
Section A

Instructions

1. Please read through the instructions very carefully before you start answering the questions.

2. For the boxed questions of Yes/No indicate your choice by ticks in the appropriate boxes.

3. The questions with spaces to be filled should be answered in the spaces provided next to the statement.

4. Please, be honest and sincere as possible. The information you will give will help improve performance and enrolment in your area and the whole country.

5. Make one choice for every statement.

Section B: Tick (√) the appropriate box.

1. Which type of primary school did you attend?
   (a) Boarding
   (b) Day
   (c) Mixed
   (d) Mission school

2. How did you perform in science in K. C. P. E.?
   (a) Grade A
   (b) Grade B
   (c) Grade C
   (d) Grade D
(e) Grade E  

What is the average number of students in your class (stream)?
(a) 0-10  
(b) 11-20  
(c) 21-30  
(d) 31-40  
(e) Above 40  

3. Which topics in physics do you find difficult in the syllabus and why?

List four topics

1. .............................................................................................................................

2. .............................................................................................................................

3. .............................................................................................................................

4. .............................................................................................................................

Reasons

1. ...................................................................................................................................

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

2. ...................................................................................................................................

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

3. ...................................................................................................................................

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

5. Is the physics syllabus wide compared to other subjects?

Yes  

No  

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6. What was your performance in the last physics exam?

(a) Excellent  
(b) Very good  
(C) Good  
(d) Average  
(e) Below average  

7. What do you intend to be after school [occupation]?

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

8. Does your family influence your choice of occupation?

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

9. Briefly explain why you like that occupation

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

10. How will physics help in the occupation you intend to take after school?

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

11. Does your teacher help you understand the procedures in the physics practical work?

Yes  
No  

12. Are there a relationship between what you learn in physics class and what is happening every day?

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

13. Do your parents provide learning materials for example textbooks?

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14. How do you share physics textbooks?

15. Does your school have enough physics laboratory equipments and apparatus?
   Yes   No

Section C: Tick in appropriate box using the following information. You are to tick (√) only one box for every statement.

In the choices, SA Stands for Strongly Agree
   A Stands for Agree
   N Stands for Neutral or Not Sure
   D Stands for Disagree
   SD Stands for Strongly Disagree

16. Physics is useful in future life
   SA   A   N   D   SD

17. My friends influenced me to choose physics
   SA   A   N   D   SD

18. I often study physics on my own
   SA   A   N   D   SD

19. My parents/guardians influenced me to choose physics
   SA   A   N   D   SD

20. Physics is a difficult subject
   SA   A   N   79   D   SD
21. My friends do not like physics
   SA A N D SD

22. The teaching and learning facilities in the school are adequate
   SA A N D SD

23. My physics teacher influenced me to choose physics
   SA A N D SD

24. We do not do CATS and assignment very often
   SA A N D SD

25. I enjoy doing mathematics and physics
   SA A N D SD

26. Our teacher does not help us to solve difficult physics problems
   SA A N D SD

27. I am able to handle physics practical on my own
   SA A N D S

28. Our teacher helps us handle physics practical
   SA A N D SD

29. I enjoy physics lessons
   SA A N D SD
30. What five factors should be improved in your school to raise the performance of physics?

1. ........................................................................................................................................
   ............................................................................................

2. ........................................................................................................................................
   ............................................................................................

3. ........................................................................................................................................
   ............................................................................................

4. ........................................................................................................................................
   ............................................................................................

5. ........................................................................................................................................
   ............................................................................................

Thank you for your cooperation and contribution.

APPENDIX 4

Achievement Test
I am interested in finding out the factors influencing performance and enrolment of physics among girls in secondary schools. The test is to give information for the research being carried out. Please give sincere and honest answers to the questions asked to the best of your ability. The information will be treated as very confidential between you and the researcher.

**General Information**

Name of school........................................................................................................................................

Class..........................................................................................................................................................

Name of the student......................................................................................................................................

**INSTRUCTIONS**

1. Please read through the instructions very carefully first before you start answering the questions.

2. Answer ALL the questions in sections A and B in the spaces provided.

3. ALL working must be clearly shown.

4. Mathematical tables and electronic calculators may be used.

   Take acceleration due to gravity \( g = 10 \text{m/s}^2 \)

For Examiners Use Only

<table>
<thead>
<tr>
<th>Section</th>
<th>Question</th>
<th>Maximum score</th>
<th>Candidate’s score</th>
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<tr>
<td>B</td>
<td>6-10</td>
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<tr>
<td>Total Score</td>
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</table>
Section A

1. Explain why a wire gauze is used when heating water in a laboratory (2 marks)

   *A wire gauze is a good conductor of heat hence it distributes heat uniformly to the heating surface.*

2. The weight of a car is 6000N and the recommended tire pressure is 30N/cm². Find the area of each tire in contact with the ground (3 marks)

   Each tire = 6000N / 4

   = 1500N

   \( P = \frac{F}{A} \)

   = 1500 / 30

   \( A = 50cm^2 \)

3. State the ways of reducing surface tension (2 marks)

   *Boiling or heating the liquid*.

   *Adding impurities*.

4. The water level in a burette is 35cm³. If 20 drops of water are added what is the new level if each drop has a volume of 0.1cm³. (2 marks)
5. 200g of fresh water of density 1g/cm³ was mixed with 200cm³ of sea water of density 1.2g/cm³. Determine,

(a) Mass of sea water  
\[ M = \rho \times V \]
\[ = 1.2 g/cm^3 \times 200 cm^3 \]
\[ = 240g \]

(b) Volume of fresh water  
\[ V = \frac{m}{d} \]
\[ = \frac{200g}{1g/cm^3} \]
\[ = 200cm^3 \]

(c) Density of mixture  
\[ D = \frac{m}{\nu} \]
\[ = \frac{(240+200)g}{(200+200)cm^3} \]
\[ = 1.11 g/cm^3 \]
6. Brownian motion of smoke particles can be studied by using the apparatus shown in fig. below. To observe the motion, smoke is enclosed in the smoke cell.

![Diagram of Brownian motion apparatus](image)

a) Explain the role of the following

I. Bulb
   (1mark)

   *Produce or source of light*

II. Lens
   (1mark)

   *Converge light to the smoke cell for illumination.*

III. Microscope
   (1mark)

   *Magnify or enlarge the smoke particles in the smoke cell.*

b) State and explain the nature of the observed motion of the smoke particles (3marks)

   *The smoke particles will move faster or more rapidly than before in random continuous manner because of collision with invisible air molecules and amongst themselves.*
c) State and explain what will be observed about the motion of the smoke particles if the temperature is raised slightly. (3 marks)

*The smoke particles will move faster or more rapidly than before due to increased kinetic energy of the particles.*

d) State two ways in which ammonia gas can be made to diffuse faster from one end of a room to the other end. (3 marks)

- increase the temperature
- introduce another lighter gas.

**Section B**

7. Fig below shows a body being acted on by two forces $F_1$ and $F_2$

\[ F_1 \rightarrow \rightarrow F_2 \]

Draw the force $F_3$ that has the same effect on the body as the two forces. (2 marks)

8. State Pascal’s principle of transmission of pressure in fluids (1 mark)

*States that pressure is transmitted equally in all directions of the enclosed container.*

9. A pipe of radius 6mm is connected to another pipe of radius 9mm. If water flows in the wider pipe at the speed of 2m/s. What is the speed in the narrow pipe? (3 marks)

\[ A_1v_1 = A_2v_2 \]

\[ 6^2 \cdot v_1 = 9^2 \cdot 2 \text{m/s} \]

\[ v_1 = 4.5 \text{m/s} \]

10. (a) distinguish between solid and liquid state of matter in terms of intermolecular forces (1 mark)
Solids have regular and compact arrangement of particles/molecules while liquids have large intermolecular distances.

(c) In an experiment to estimate the diameter of an oil molecule, an oil drop of diameter 0.05cm spreads over a circular patch whose diameter is 20cm. Determine

(i) The volume of the oil drop (3marks)

\[ V = \frac{4}{3} \pi r^3 \]

\[ = \frac{4}{3} \times \frac{22}{7} \times \left( \frac{0.05}{2} \right)^3 \]

\[ = 0.001375 \text{cm}^3 \]

(ii) The area of the patch covered by the oil (3marks)

\[ A = \pi r^2 \]

\[ = 3.142 \times 10 \times 10 \]

\[ = 314.2 \text{cm}^2 \]

(iii) The diameter of the oil molecule in meters (4marks)

\[ D = \frac{V}{A} \]

\[ = \frac{0.001375}{314.2} \]

\[ = 4.5 \times 10^{-6} \text{cm} \]

(d) States

(i) Assumptions made in (c) above (3marks)

- the oil drop is spherical. \( \checkmark \)

- the oil patch is a monolayer. \( \checkmark \)

- the diameter of the oil molecule is the size of the molecule.
-the oil patch is a perfect circle

(ii) Two possible sources of errors in this experiment

-When measuring the diameter of the oil drop.

-When measuring the diameter of the oil patch.

APPENDIX 5
SCHOOL STRATA IN NANDI SOUTH DISTRICT AND PERFORMANCE IN THE ACHIEVEMENT TEST

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<td><strong>TOTAL ENTRIES</strong></td>
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<td><strong>517</strong></td>
</tr>
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</table>
APPENDIX 7

RESEARCH PERMIT

THIS IS TO CERTIFY THAT:

Prof./Dr./Mr./Mrs./Miss/Institution
Joseph Kirua Ng’etich
of (Address) Kenyatta University
P.O.Box 43844-00100, Nairobi

has been permitted to conduct research in

Nandi South
Rift Valley

Location
District
Province

on the topic: Factors influencing low enrolment and poor performance in Physics: The case of girls secondary schools in Nandi South District, Kenya

for a period ending: 20th September, 2013.

Research Permit No. NCST/RCD/14/013/345
Date of issue
4th April, 2013
Fee received
KSH. 1,000

Applicant’s
Signature

National Council for
Science & Technology

Secretary