INFLUENCE OF MANAGEMENT OF LABORATORY FACILITIES ON STUDENTS' PHYSICS ACHIEVEMENT IN SECONDARY SCHOOLS OF NJORO SUB COUNTY, NAKURU COUNTY, KENYA.

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A thesis submitted to the Graduate School in partial fulfilment for the requirements of Master of Education Management (Planning) degree of Egerton University

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DECLARATION AND RECOMMENDATION

Declaration

This thesis is my original work and has not been presented for the conferment of a degree, diploma or any other award in this or other University.

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Recommendation

This thesis has been submitted for examination with our approval as the University Supervisors.

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DEDICATION

This work is dedicated to my late dad Jackson Kitavi Malika. I also thank my dear husband Stanley Maingi for the immense love, support and encouragement he accorded me during the trying times as I endeavored to make meaning of this work. I appreciate my lovely daughter Faith Cherry; those lonely moments spent in solitude due to my absence did not all go in vain. Your moral support, prayers and understanding were priceless. Thank you very much for the sacrifice.

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ABSTRACT

Physics is a science subject that provides the foundation of industrial, technological and economic development of any country. The ministry of education Kenya has been dispersing to schools Free Day Secondary Education (FDSE) funds amounting to 22,240 for schools to buy laboratory equipment among other needs which are important in the practical approach of teaching. Despite this, student's achievement in the Kenya Certificate of Secondary Examination (KCSE) physics in Njoro Sub County as from 2014 -2017 has been below a mean grade of C. The poor performance may perhaps be due to Management of Laboratory Facilities (MLF) among other factors. The study examined influence of MLF on students' achievement in physics of public secondary schools in Njoro Sub County. The study adopted the cross-sectional research design. The target population of the study comprised all the 8229 students and 60 physics teachers in public secondary schools in Njoro Sub County. The accessible population was all the 60 physics teachers and 2385 form two students in the 35 public schools in sub-county schools. A sample size of 343 form two students and 53 physics teachers was obtained through stratified random sampling from 12 co-educational schools in Njoro Sub County. A student's physics practical achievement test (SPPAT), Laboratory Facility Observation Checklist (LFOC) and Physics Teacher Laboratory Facilities Management Questionnaire (PTLFMQ) were used to collect data. Content and face validity of LFOC and PTLFMQ were examined by experts from the department of Curriculum, Instruction and Educational Management, Egerton University while that of SPPAT was validated by five experienced secondary school physics Kenya National Examination Council Examiners (KNEC). Reliability of SPPAT was estimated using the Kuder-Richardson formula (K-R21) while that of the PTLFMQ and LFOC were determined using the Cronbach Alpha. The instruments yielded reliability coefficients of 0.988, 0.933 and 0.801 respectively which were all above recommended 0.7 thresholds. Data were analysed with the aid of the Statistical Package for Social Sciences (SPSS -22) programme. Frequencies, percentages, means and standard deviations were used to describe and summarise data. Hypotheses were tested at the 0.05 level of significance using simple linear regression. The findings of the study are expected to improve students' achievement in physics through Planning for laboratory facilities, organization of laboratory facilities, coordination of laboratory facilities of physics teachers and leadership in laboratories which are significantly related to students' performance in physics practical. The research recommends the ministry of education to consider coming up with training programmes for enhancing the managerial skills of physics teachers. The ministry of education may come up with training programmes for enhancing the managerial skills of physics teachers in areas of planning, organization, coordination, leadership and control of laboratory facilities. The study may also offer guidance to the Teacher Service Commission (TSC) on the Teacher Performance Appraisal and Development (TPAD) which monitors the students learning and teaching especially through the lesson observation. Students will also benefit from the study through enhancement of teacher managerial skills of laboratory facilities and therefore improving their performance.

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LIST OF ABBREVIATIONS AND ACRONYMS

ASE	Affordable Secondary Education
ASEI	Activity, Student-Centered Experiment and Improvisation
CBE	Curriculum Based Establishment
CEMASTEA	Centre for Mathematics, Science and Technology Education in Africa
DEO	District Education Officer
DQASO	Directorate of Quality Assurance and Standards Officer
EFA	Education for All
FSE	Free Secondary Education
KCSE	Kenya Certificate of Secondary Examination
KEMI	Kenya Education Management Institute
KICD	Kenya Institute of Curriculum Development
KNEC	Kenya National Examination Council
KUCCPS	Kenya Universities and Colleges Central Placement Service
LFOC	Laboratory Facility Observation Checklist
MDG	Millennium Development Goals
MLF	Management of Laboratory Facilities
NACOSTI	National Commission for Science, Technology and Innovation
NSTA	National Science Teacher Association
PLF	Physics laboratory facilities
PTLFMQ	Physics Teacher Laboratory Facility Management Questionnaire
QMS	Quality Management Systems
QMSPLF	Quality Management Systems of Physics Laboratory Facilities
SMASSE	Strengthening of Mathematics and Science in Secondary Education
SPPAT	Students' Physics Practical Assessment Test
SPSS	Statistical Package for Social Science
TPAD	Teacher Performance Appraisal and Development
TSC	Teacher Service Commission
T/L	Teacher and Learning

CHAPTER ONE
INTRODUCTION

1.1 Background of the Study

Physics is a branch of science that explains the property of matter and energy, and the relationship between them (Lawrenz, Wood, Kirchhoff, Kim & Eisenkraft, 2009). Knowledge of physics is very important in the technological world because its principles and laws are applied in many areas in the life of man. Physics helps mankind to study the universe and understand how our environment works. The laws, facts, theories and principles of physics make us interact better with our surrounding (Dupe, 2013). Inventions of cars, air conditioners, mobile phones, lights, laptops, fans, air buses, micro waves are all made possible through the application of physics principles (Olufunke, Awolowo & Blessing, 2014). Advancement in the industrial sector, medicine, electronics and communication are outcomes of application of physics (Olufunke, 2012). Shamim, Rashid, and Rashid (2013) posit that the technological potential of a country is more accurately gauged by the quality of its physics education than by any other single index. It is therefore necessary that nations which wish to develop technologically must provide quality physics education (Aderomu & Obafemi, 2015).

Physics is one of the science subjects besides biology and chemistry that is taught in secondary schools. The aims of teaching secondary school physics are to equip leaners with basic knowledge on scientific enquiry, foster problem solving skills and enhance their career development (Pollock & Finkelstein, 2010). It also aims at equipping leaners with knowledge; skills that would enable them accurately predict outcomes of natural phenomena such as effects of gravity and engage in industrial activities (Kost-Smith, Pollock, & Finkelstein, 2010). A learner with physics background is expected to think both deductively and inductively and approach situations with a high degree of precision (Munene, 2014).The learner is expected to be innovative and creative in all that they do.

The Ministry of Education in Kenya has recognized physics as one of the important subjects and has thus emphasized its teaching and learning in high schools. However, it is not attractive to most students as they tend to avoid it when provided with an alternative (Olufunke, Awolowo & Blessing, 2014).Most students drop the subject at form two and its only a few who manage to form four.. The KNEC is graded on a scale of 1 to 12 depending on the percentage mark scored in the exam. Table 1 shows the percentage marks and their corresponding mean point and grade.

Table 1:

KCSE Percentage Marks and the Corresponding Mean Points and Mean Grades

Percentage %	**Mean Score**	**Mean Grade**
0-34	1	E
35-39	2	D-
40-44	3	D
45-49	4	D+
50-54	5	C-
55-59	6	C
60-64	7	C+
65-69	8	B-
70-74	9	B
75-79	10	B+
80-84	11	A-
85-89	12	A

The students are graded based on Table 1. A student scoring 34% for example attains a mean grade of E with mean score of 1. The percentage marks and the corresponding grade varies yearly depending on the overall performance of the paper in the exam. The national Students' academic performance in the physics subject has generally been poor over the years. The KNEC provides schools with repots on the performance of each paper and question by students. This report serves a basis for teachers to assist students in addressing the difficult areas experienced in the exam before seating for the KCSE. The KNEC reports indicates that the theory papers p1 and p2 were fairly done by the students and performed poorly in P3 which tests on the students practical. The achievement of the students in the KSCE for the years 2014 -2017 is tabulated in Table 2

Table 2:

National KSCE Mean Score and Corresponding Mean Grades in Physics for the Years 2014 -2017

Year	Mean Score	Mean Grade
2014	4.75	C-
2015	5.24	C-
2016	3.32	D
2017	4.96	C-

Source (Kenya National Examination Council, 2018).

Table 2 indicates that the mean score were in the range of 3.32 to 5.24. The students' performance was below average mean score of six given that the means were out of a maximum of 12 required by the KNEC. The poor performance was mainly observed in paper 3 and hence the need to find out the cause.

The student's poor achievement in physics was not only observed in the county but was too reflected in the county, precisely Nakuru County. The performance of physics in the county has been dismal over the last four years as shown in the Table 3.Nakuru County Students' KCSE Mean Grade/points in Physics for the Years 2014 -2017

Table 3:

Nakuru County Students' KCSE Mean Score/Grade in Physics for the Years 2014 -2017

Year	Mean Score	Mean Grade
2014	4.94	C-
2015	4.89	C-
2016	5.57	C
2017	4.26	D+

Source: Nakuru County Education Office 2018

Data on Table 3 reveals that the mean grades and the mean scores were declining over the years2014-2017. The mean score ranged between 4.26 and 5.57 out of a maximum of 12. The Students achievement in physics in Njoro Sub County was not better than that in the county. The performance of physics in the KCSE in Njoro Sub County for the years 2014-2017 was below 50% (below a mean score of 6). The trend of the poor performance is indicated in Table 4.

Table 4:

Njoro Sub-County Students' KCSE Mean Grades and Score in Physics for the Years 2014-2017

Year	Mean Score	Mean Grade
2014	5.26	C-
2015	5.92	C-
2016	3.86	D+
2017	3.32	D

Source: DQASO Njoro (2018), KNEC (2014, 2018)

Data on Table 4 reveals that the mean score were low as they ranged between 3.32 and 5.26 out of a maximum of 12. According to Chireshe (2015) low academic achievement leads to undesirable wastage through dropouts and repetition besides denying students the opportunity to join quality courses in post-secondary school institutions. It also jeopardizes students' opportunities for future job placement and reduces their chances of meaningfully participating in national development (Buhere, 2007).

Literature shows that there are many factors that affect students' achievement. Chireshe (2015) noted that teacher related factors such as qualification, experience, instructional leadership, commitment to work and ability to cover the syllabus and management of students; homework and assignments were key determinants of academic achievement. Olufunke, Awolowo and Blessing (2014) noted that teaching method is a significant determinant of achievement in physics as presentation is key to acquisition and retention of content. Attitude has been found to significantly affect students' choice and achievement in physics (Glore, 2013). This is so because attitudes determine the amount of time and effort dedicated to the subject and this ultimately improves students' performance in the subject. Likoko, Mutsotso and Nasongo (2013) and Dessarollo (2008) observed that facilities significantly affect the teaching and learning of physics which in turn influences students' achievement in physics.

Facilities are very important in teaching and learning of any subject as they make the processes pleasant and offer an experience which stimulates self-activity and imagination on the part of the students (Sharma, 2008). Facilities contribute significantly towards academic achievement because they save the teachers' time and effort, increase pupil's interest and facilitate retention of what is learned (Oladejo, Olosunde, Ojebisi & Isola, 2011). Schools require basic facilities like furniture, classrooms, instructional materials and libraries among others to run their programmes effectively. Those which offer science subjects like biology, chemistry and physics must have laboratories in addition to the basic requirements as competence in sciences require wide exposure to practical. Good performance of students in physics practical subject cannot be achieved in the absence of laboratory equipment. Schools may have the equipment but not until they actively involve the students in the laboratory practicals can student achievement be improved. Changeiywo, Wambugu, and Wachanga (2010) asserts that, for Physics and other sciences to be understood, there is need to emphasis their instruction through practical approach.

Management of school facilities has also been found to influence students' academic achievement. Management of laboratory facilities focussed on the availability and adequacy of equipment in the laboratory. Further to the adequacy, the study focused on how frequent the students did the practicals in the laboratory using the equipment with the guidance and direction of the physics teacher. Proper scheduling of practicals in done to ensure that all students participate in the practicals as well as classwork. Laboratory technicians are important in the student achievement in physics. The technicians arrange the apparatus in the laboratory for the students to be able to carry out the practicals. The association between the teachers and the laboratory technicians ensures that all the activities and procedures in the laboratory are followed according to the manual for a given practical. It is the role of both the laboratory technicians and physics teachers to prepare budget for the physicals practicals based on the items or equipment used in the practicals.

According to the International Facilities Management Association (2003), this culminates in the collective and participative decision making process towards the selection, establishment and installation of school plants and equipment. This ensures timely availability of the required teaching and learning facilities. Uko and Ayuk, (2015) assert that management of facilities enhances achievement since effective learning only takes place when the required teaching-learning materials are provided in adequate quality and quantity and at appropriate times.

Management of Laboratory Facilities (MLF) is considered as one of the major driving force behind the teaching, learning and achievement in physics (National Research Council, 2010).

It refers to the application of scientific methods to prepare the physical learning environment for the actualization of the educational goals and objectives (Asiabaka, 2008). According to Nbina (2011), MLF enhances identification and judicious utilization of resources to achieve the objective of helping students to learn. Asiabaka (2008) argues that advances in science and technology, necessitate that the school managers adopt modern methods of facilities management. According to Okumbe (2009), management revolves around five functions: planning, organizing, coordinating, commanding/Leading and controlling.

Planning laboratory facilities involves constantly checking the availability and adequacy of stock as well as their condition so as to make arrangements for acquisition of more equipment as per the student's needs (Abdulkadir & Ma'aji, 2014). Organizing ensures that a laboratory has adequate staff with clearly defined roles. Coordination enables scheduling of activities such that teachers can carry out demonstrations and students have the opportunity to carryout 'hands on' activities in class without collision (McNamara, 2009). Leadership entails motivation or influence of teachers on students' ability to perform the practicals. Controlling ensures users are aware of health and safety regulations and practice them whenever they are in the laboratories (Uko & Ayuk, 2015).

Effective management of laboratory facilities leads to their availability of facilities whenever required, optimum utilization and enhanced health and safety of users (Makewa, Role & Biego, 2011). Effective management ensures that all the equipment and reagents are available whenever required and are maintained and calibrated regularly. This reduces cost of repairs and interruption of services due to breakdowns and increases the accuracy and confidence in the test results (World Health Organisation), 2011). A good laboratory facilities management programme ensures that practical sessions are well planned and organised in such a way that the environment is not only safe but conducive to teaching and learning (Matson, 2007).

Literature has shown that effective management of laboratory facilities leads to optimum utilization of resources thus enhancing the teaching and learning process and academic achievement (Lunenburg, 2010). Management activities such as planning ensures that selected equipment/instruments and reagents are appropriate and of quality (Akani, 2012). This reduces variation in test results and ensures high level of performance. Coordination ensures that students perform class experiments without clashing (McNamara, 2009). Leadership significantly affects organization of class activities and learning (Leithwood, Day, Sammons, Harris & Hopkins, 2006). An evaluation by Morgan (2009) showed that the condition, adequacy and effective management of educational facilities had a stronger effect on the overall performance of students than the combined influences of the family background, socio-economic status, school attendance and behaviour. Based on the foregoing, it is possible that the poor performance in physics in Njoro Sub County will be due to management of laboratory facilities.

1.2 Statement of the Problem

The ministry of Education in Kenya has recognized physics as one of the important subjects and has thus emphasized its teaching and learning in secondary schools. In respect to this, the ministry of education, Kenya supports the schools by dispersing Free Day Secondary Education (FDSE) funds of amount Ksh.22,240 based on the school students enrolment entered in the National Education Management Information System (NEMIS) to purchase and equip their laboratories with laboratory equipment among other needs. Despite the government's financial support to schools with FDSE funds, the student's achievement in physics was below average in public secondary schools in Njoro Sub County in the years 2014-2017. The mean scores ranged from 3.32 to 5.92 out of a maximum of 12. Several studies have been carried out on student achievement in physics subject but their focus has been on gender, teaching methods, teacher factors, socio-economic status, parental education and school environment among others. There is limited evidence relating management of laboratory facilities and students' academic achievement in physics in general and in Njoro Sub County in particular. Therefore the need for a study to fill the gap. The low achievement in the subject may perhaps be due to improper management of laboratory facilities given that laboratories play a significant role in physics achievement.This study therefore, sought to investigate the influence of management of laboratory facilities on students' achievement in physics in Njoro sub county, Nakuru County, Kenya.

1.3 Purpose of the Study

The purpose of this study was to investigate the influence of management of laboratory facilities on students' academic achievement in physics in public secondary schools of Njoro Sub County.

1.4 Objectives of the Study

The specific objectives of the study were:

i) To determine the influence of planning for laboratory facilities on students' achievement in physics in public secondary schools in Njoro sub-county.

ii) To determine the influence of organization of laboratory facilities on students' achievement in physics in public secondary schools in Njoro sub-county.

iii) To establish the influence of coordination of laboratory facilities on students' achievement in physics in public secondary schools in Njoro sub-county.

iv) To establish the influence of leadership in the laboratory on students' achievement in physics in public secondary schools in Njoro sub-county.

v) To determine the influence of control of laboratory facilities on students' achievement in physics in public secondary schools in Njoro sub-county.

1.5 Research Hypotheses

The following hypotheses were tested:

H_o1: Planning for laboratory facilities has no statistically significant influence on students' achievement in Physics in public secondary schools in Njoro Sub-County.

H_o2: Organization of laboratory facilities has no statistically significant influence on students' achievement in physics in public secondary schools in Njoro Sub-County**.**

H_o3: Coordination of laboratory facilities has no statistically significant influence on students' achievement in physics in public secondary schools in Njoro Sub-County.

H_o4: Leadership in the laboratory has no statistically significant influence on students' achievement in Physics in public secondary schools in Njoro Sub-County.

H_o5: Control of laboratory facilities has no statistically significant influence on students' achievement in physics in public secondary schools in Njoro Sub-County.

1.6 Significance of the Study

The findings are expected to contribute towards improvement of students' achievement in physics. The ministry of education may come up with training programmes for enhancing the managerial skills of physics teachers in areas of planning, organization, coordination, leadership and control of laboratory facilities. The research maybe also useful to other science subject teachers through attending laboratory managerial courses and other programmes like, Strengthening of Mathematics and Science in Secondary Education

(SMASSE) and Kenya National Examination Council training (KNEC). The study may also offer guidance to the Teacher Service Commission (TSC) on the Teacher Performance Appraisal and Development (TPAD) which monitors the students learning and teaching especially through the lesson observation. Students will also benefit from the study through enhancement of teacher managerial skills of laboratory facilities and therefore improving their performance. Academicians and future researchers will further benefit from the study in laying a foundation of their further research work.

1.7 Scope of the Study

The study focused on management of the physics laboratories and students' achievements in Measurement II, Turning effect of a force and Hooke's' law. The study sampled only form two students drawn from co-educational secondary schools in Njoro sub county, Nakuru county, Kenya. The study was carried out in the twelve co-educational secondary schools for a period of one month .The number of students and physics teachers involved in the study were 343 and 53 respectively.

1.8 Limitations of the Study

The study was carried out among co-educational public secondary schools in Njoro sub-county. Consequently, the findings should be generalized to other category of schools within the sub county with caution due to difference in facilities.

1.9 Assumptions of the study

The following assumptions were made during the study:

i) The respondents were honest when providing information sought from them.
ii) The form two students already covered topics on Measurement II, Turning effect of a force and Hooke's' law in which they were tested on.

1.10 Definition of Terms

The following are the constitutive and the operational definitions of the terminologies used in the study.

Achievement: The realisation of scores in an Achievement Test by students. In this study, it refers to student's attainment of scores in Students Physics Practical Achievement Test (SPPAT).

Controlling: Something used as a standard of comparison for checking the results of a survey or experiment. According to the study, control of laboratory facilities involves the safety and proper maintenance of the laboratory facilities to provide a healthy and safe working environment in the laboratory

Coordination The linking together different parts of an organization to accomplish a collective set of tasks" or integrating or linking together different resources to accomplish a collective set of tasks (Lunenburg, 2010). It has also been defined as bringing the different elements of an organization into an efficient relationship (Xaba, 2012). In this study, it refers to physics teacher's ability to ensure that physics class experiments are conducted as scheduled, with appropriate facilities and without one clashing with the other.

Influence: According to Merriam-Webster's Learner's Dictionary (Merriam Webster Dictionary, 2016), it is the power to change or affect someone or something without the use of force. In this study, it will be expressed in terms of the correlation coefficient and the variation in achievement accounted for by the predictor variables; planning, organizing, coordination, leadership and control.

Laboratory Facilities - The equipment and materials that offer students opportunities to learn about science through hands-on process. In this study it refers to the buildings, fittings, equipment and apparatus used to conduct experiments as per the secondary school physics curriculum

Leadership: Refers to the act of leading a group of people or an organization by establishing a clear vision, sharing it with others so that they follow willingly (Ulela, 2015). In the study, it means physics teachers guiding students during experiments leading to realization of learning outcomes

Management of Laboratory Facilities: It refers to the application of scientific methods to prepare the physical learning environment for the actualization of the educational goals and objectives (Asiabaka, 2008). In this study, Management of Laboratory

Facilities referred to the collective and participative decision making process towards the selection, establishment and installation of school plants and equipment.

Management: Management refers to the processes of planning, organising, staffing, directing and control (Okumbe, 2009). In this study, it refers to planning, organising, leadership, coordination and control of physics laboratory facilities

Organization: Organizing in the study is the management structure of the laboratory and the personnel involved.

Planning: Detailed proposal for doing or achieving something. In the study, planning is an inventory of the available and adequacy of facilities to determine the need for more purchase.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

This chapter presents the literature review. It begins by examining the teaching and learning of physics. It then reviews academic achievement in the subject and relates it to facilities. Thereafter, the chapter examines management of laboratory facilities and its influence on physics achievement. The last sections of the chapter describes the theories that informed the study and the conceptual framework depicting the relationship among the variables.

2.2 Teaching and Learning Physics

Physics is a branch of natural science that deals with matter, energy & motion and their in-relationship through space and time (Pollock & Finkelstein, 2010). Physics is a core science subject that is closely related to technology. The subject focuses on the general nature of the natural world and has played a crucial role in service to mankind (Isola, 2010). It explains the property of matter and energy, and the relationship between them (Lawrenz*et al*, 2009). Knowledge of Physics is important in the technological world because its principles and laws are applied at various degrees in our lives. Advancement in Physics leads to effectiveness in astronomy, communication, engineering, computing, amongst others (Makanda, 2015).

Physics is considered important in the Kenyan education system and as a result is a compulsory subject in the first two years of the four-year secondary school education system and an elective in the third and fourth years (Njoroge, Changeiywo & Ndirangu, 2014). The objective of teaching physics in secondary schools is not only to communicate the spirit of science but also to ensure that students acquire the skills of science (Olufunke, 2012). The general goals of learning Physics is to equip leaners with basic knowledge on scientific enquiry methods, foster problem solving skills and enhance their career development (Akweya, Twoli & Waweru, 2015). The other reasons for teaching secondary school physics are to create awareness on its effect in the everyday life of man and to promote technological and socio-economic development in society (Onasanya & Omosewo, 2011). Practical activities carried out by students in class provide the foundation of technological development and prepare them to pursue science related courses at higher levels (Abungu, Okere & Wachanga, 2014).

Physics like other science subjects is practical oriented and hence is best learnt through experiments, observations, analysis and generalization of conclusions (Mangaoang-Boado, 2013). Olufunke (2012) notes that for Physics and other sciences to be understood, their instruction in secondary schools should be through practical approach. Akweya*et al* (2015) concur with Olufunke (2012) by arguing that science derives its power and authority from its empirical method that comprises inference from observations and experiments The other advantage of learning by experiments is that it fosters teamwork and manipulative skills as well as promoting observational, deductive and evaluative skills (Wan &Van, 2006). Based on the above observations, teachers should give practical activities more attention during instruction as it assists learners construct knowledge through interaction with experiments. Availability of the equipment in the laboratory may not be enough in enabling the students improve on performance. The students must use the equipment in doing the practical for the improvement to be realised

2.3 Students Achievement in Physics

Each curriculum is designed to achieve set educational goals (Njengere, 2014). The extent to which the goals have been achieved is commonly measured with respect to the degree to which those exposed to the curriculum has satisfied the community needs and their academic achievement in national examinations (Abdulkareem, 2001). Academic achievement refers to students' success in meeting the goals of education such as completing high school or earning a college degree (York, Gibson & Rankin, 2015). It also represents outcomes that indicate the extent to which a person has accomplished specific goals that were the focus of instruction in school, college, or university (Birgit, 2012). The outcome is measured by class assignment, practicals, continuous assessment tests and national examinations (UNESCO, 2010). In Kenya, KCSE measure secondary school student's academic achievement in physics and other subjects.

Further studies have revealed that the performance of students in secondary school physics has consistently remained poor over the years across the globe. Lawrenz, Wood, Kirchhoff, Kim and Eisenkraft's (2009) study conducted in the United States of America revealed that high school student's achievement in physics was below expectation. Mangaoang-Boado (2013) noted that high school students' performance in physics in Philippines was relatively low. Isola (2010) and Adeyemo (2012) also observed that high school students in Nigeria achievement in the subject was below average. The studies by Lawrenz, Wood, Kirchhoff, Kim and Eisenkraft's (2009), Mangaoang-Boado (2013), Isola (2010) and Adeyemo (2012) were carried out outside Kenya and in different curriculum and therefore a contextual research gap that the current study sought to fill.

Students' performance in physics in Kenya has also been poor over the years (Makanda, 2015; KNEC, 2016). A study by Makanda (2015) was done in Secondary Schools in Kimilili Sub-County in Bungoma County while the current study was done in Njoro Sub-County in Nakuru County and therefore presented a contextual research gaps that the current study sought to fill. In addition, the Kenya National Examinations Council presented Physics results in general and therefore performance in Physics Practicals remained unknown and therefore the basis of the current study. A study by Akweya, and Waweru (2015) revealed that boys have continued to perform better than girls in physics do. Akweya, and Waweru (2015) focused on factors influencing girl's performance in physics in national schools in Kiambu and Nairobi counties while the current study focused on both the boys and the girls and therefore making the current study different. The poor performance in the subject has been attributed to several factors. Scholars (El-Rabadi, 2013; Lawrenz*et al*, 2009) have attributed the unsatisfactory performance in physics to factors such as leadership, teaching methods, teacher factors, socio-economic status, parental education and school environment among others. None of the researchers focused on management of laboratory facilities and therefore opening a research gap for the current study that sought to investigate the influence of management of laboratory facilities on students' academic achievement in physics in public secondary schools of Njoro Sub County.

Students' academic achievement in physics has related to many factors. McGuffin (2011) observed that principals lead schools, which perform well, and subject teachers who have the ability to set pace, lead and motivate staff and students to perform to their highest potential. Different form the study by McGuffin (2011) on school principals, the current study sampled the physics teachers and physics students. This presented a methodological research gap that the current study sought to fill. However, Lydiah and Nasongo (2009), argue that schools require good leaders to organize the process of teaching and learning to ensure that the mission of the school is achieved. Thakur (2014) assert that leadership is a major determining factor of the quality of education and school performance.

Shamim, Rashid and Rashid (2013) conducted a study on the teacher factors influencing students' academic performance in physics in secondary schools of Jammu and Kashmir states in India. The study observed that teachers play an important role in students' achievement because it is their responsibility to shape student's academic achievement. They also noted that socio-economic status, parental education and school environment had a significant effect on academic performance. The study by Shamim, Rashid and Rashid (2013) was done in India while the current study was done in Kenya. The two countries have different education systems and also experience heterogeneous factors related to student achievement and therefore the two studies could not be comparable leading to a contextual research gap.

Several studies have shown that there is a correlation between students' achievement in physics and gender, with the male students out performing their female counterparts (Kost-Smith, Pollock, & Finkelstein, 2010). Olufunke, Awolowo and Blessing (2014) attribute the gender disparity to culture and socialization which recommend to girls courses that do not require more energy and brain tasking such as home making while the boys moulded for jobs in management, engineering, banking and other brain tasking professions. The studies by Kost-Smith, Pollock, and Finkelstein (2010), and Olufunke, Awolowo and Blessing (2014) were comparative studies on boys' and girls' achievement while the current studies focused on academic achievement in Physics practicals in general for both boys and girls and therefore a methodological research gap that was filled by this study.

Teaching methods has also been associated with academic achievement by several scholars. Holmes, Roll and Bonn (2014) found that students who were taught using project based learning out performed their counterparts in regular teaching approach. Omorogbe and Ewansiha (2013) found out that the cooperative concept mapping approach-teaching method enhanced the teaching and achievement in secondary school science subject. Bello (2011) demonstrated that using small group cooperative teaching method enhanced learning in Physics. Oladejo*et al* (2011) examined the effect of instructional materials and students' academic achievement in physics. They found out that students who were taught with adequate instructional material obtained higher mean scores than those who were not. Olufunke (2012) established that availability and effective utilization of instructional facilities had a positive influence on the academic achievement of students in Physics. The study concluded that facilities are a critical variable in determining quality of output of secondary schools. The above studies have demonstrated that students' physics achievement is affected by facilities among other factors. The fore mentioned authors focused on teaching methods in Physics and its effect on the academic achievement of students in Physics subject. This presents a conceptual research gap since the current study focused on the influence of management of laboratory facilities on students' academic achievement in physics.

2.4 Facilities and Achievement in Physics

School facilities are considered key elements in an education system since the quality of learning is affected by their availability (Asiabaka, 2008). Facilities is defined as physical structures in a school such as classrooms, libraries, playgrounds, water and sanitation systems, furniture, and instructional materials (Akani, 2012). Instructional materials are the primary means through which pupils gain access to the knowledge and skills (Onasanya & Omosewo, 2011). They include; writing materials, textbooks, blackboard, diagrams, pictures, graphs and flow charts essential in the teaching and communication technology facilities such as audio-visual aids, television, projection devices and the internet.

A lot has been written to show the indispensable role of facilities in teaching and learning in school systems (Oladejo, Olosunde, Ojebisi & Isola, 2011). Mbah (2013), asserts that no matter how well trained a teacher, he/she may not be able to translate his/her competence into reality if the school lacks instructional materials. Literature (Oladejo, 2011; Morgan, 2009), indicates that resources do matter and are the single most important input to learning. Aderomu and Obafemi (2015) noted that schools endowed with teaching facilities perform better than those that are less endowed. Aderomu and Obafemi (2015) established that availability of a well-equipped laboratory contribute significantly to students' academic achievement like chemistry, biology and physics. However, the study by Aderomu and Obafemi (2015) was done in Nigeria while the current study was done in Kenya and since the two countries have heterogeneous syllabus and course coverage, there was a need to establish the influence of availability of laboratory facilities in Kenyan context.

A study by Uwezo in Kenya (2010) showed that private schools performed better than public schools because of the availability and adequacy of teaching and learning facilities. Since the current study was done in Public secondary schools only, there existed a contextual research that needed to be filled through this study. Okoth (2012) in a study conducted in public secondary schools in Ugunja and Ugenya districts, Kenya, found out that use of facilities provide an appropriate introduction and learning of new and complex concepts. Facilities also motivates students to learning thus increasing their participation and concentration. The laboratory equipment are important to a school to the extent that any school willing to excel in science subjects need to avail them to the students. Students lacking or having inefficient laboratory equipment are handicapped in practicals and their KSCE achievement is prone to be greatly affected. However, the study by Okoth (2012) focused on laboratory facilities in general and there ore failed to show which among the science subjects lacked the facilities and therefore the need to specifically focus on Physics laboratory facilities as done by this study.

2.5 Management of Laboratory Facilities

Management of school facilities is an integral part of the overall management of the school since actualization of the goals and objectives of education require provision, utilization and appropriate management of the facilities (Bello, 2011). Furthermore, advances in science and technology, require that the school managers adopt modern methods of facilities management as they improve the quality of teaching and learning (Gerring, 2016). Management is defined as the art and science of achieving goals through others (Olubu, 2015). The process of designing, maintaining an environment in which individuals work together in groups efficiently to accomplish specified goals. In its expanded form, management involves planning, coordinating, directing, leading and controlling (Okumbe, 2009). Management of laboratory facilities is concern with planning, organizing, coordinating, directing and controlling functions (Gerring, 2016).

Availing of the laboratory equipment to the students is not a guarantee for them to fair well in physics achievement. The teacher may need to schedule the practical lessons for each class to have an opportunity of utilizing them. The use of these laboratory equipment in the physics practical is effective with the guidance of the physic teacher who provides the students with instruction manuals on the procedures of doing the practical. It’s necessary for the physic teacher to move around while the students proceed with the practical to ensure that all the students acquire the practical skills of observing recording and interpreting the results of the practical. The health and safety of the laboratory is important in ensuring that it is free from rubbish and litter (Aderonmu, & Obafemi, 2015).

2.5.1 Planning for Physics Laboratory Facilities

Secondary school science facilities comprises science teaching laboratories preparation and storage areas as well as dedicated office space for science teachers and technicians(Australian Science Teachers Association 2016).Planning focuses on the availability and adequacy of facilities for actualization of goals and objectives of education (Asiabaka, 2008). Planning begins with a facilities audit, which is a comprehensive review of a facility's assets (Motz, Biehle & West, 2007). Assessing buildings, grounds, accomplish facilities audits and equipment, documenting the findings, and making recommendations on how to increase efficiency, reduce waste, and save money. It provides a landscape against which all facilities maintenance efforts and planning occur and decisions on which facilities to provide in order to ensure relevance, adequacy and quality.

Motz, Biehle and West (2007), study indicates that facility audit help planners, managers, and staff know what is available, its condition, service history, maintenance needs and location. According to Motz, Biehle and West (2007), it also ensures adequately supply and safe use of facilities. Motz, Biehle and West (2007) argued that a professionally qualified science teacher would be unable to put his ideas into practice if the school setting lacks the equipment, facilities or has inappropriate facilities due to poor planning. They established that if equipment is not readily available or is in short supply due to poor planning, teachers feel frustrated because they cannot teach a science subject as required. For example, they may have to do a demonstration instead of letting students conduct experiments or may not be able to use laboratories space during a lesson because another teacher is using it due unplanned laboratory sessions. The reviewed studies on planning for laboratory facilities however presented contextual research gaps for they were conducted outside Kenya while the current study was conducted in Kenya. The education systems and syllabus coverage differs between Kenya and other countries and therefore the planning of laboratory facilities differs significantly and therefore the need for a study in Kenyan context.

2.5.2 Organizing of the Physics Laboratory Facilities

Organizing refers to the management structure of the laboratory facilities and personnel. It involves the school principal, head of science department, subject heads, physics teachers and finally to the laboratory technicians and the students (WHO, 2010). School principals have the overall responsibility of ensuring effective management of school resources, curriculum and co-curriculum activities in order to prevent wastages and ensure achievement of educational objectives (Kabugi, 2013). The head of science departments keep financial estimates for the department, maintain quality teaching on the subject and exercise close supervision on teacher. The management of the laboratory facilities is the responsibility of science subject teachers with the assistance of support technical staff.

The inventory of the apparatus in the laboratory which is kept by the laboratory technician is used to assist on identifying the need for the physics practical apparatus. The laboratory technician works together with the head of physics department in preparing budget for the Physics laboratory facilities. The budget list is forwarded to the principal by either the physics teacher or the laboratory technician for approval. The principal in turn makes arrangement for the acquisition of the required Physics laboratory facilities. Once the facilities and equipment have been acquired, the principal communicates to the head of the Physics department or the Laboratory technician for confirmation. Figure l shows the general lines of communication in the management structure (Adeloye & Chendo 2013).

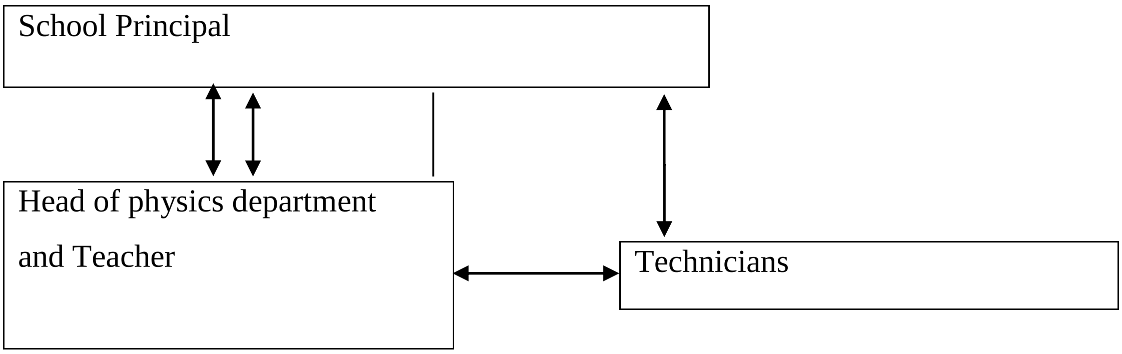


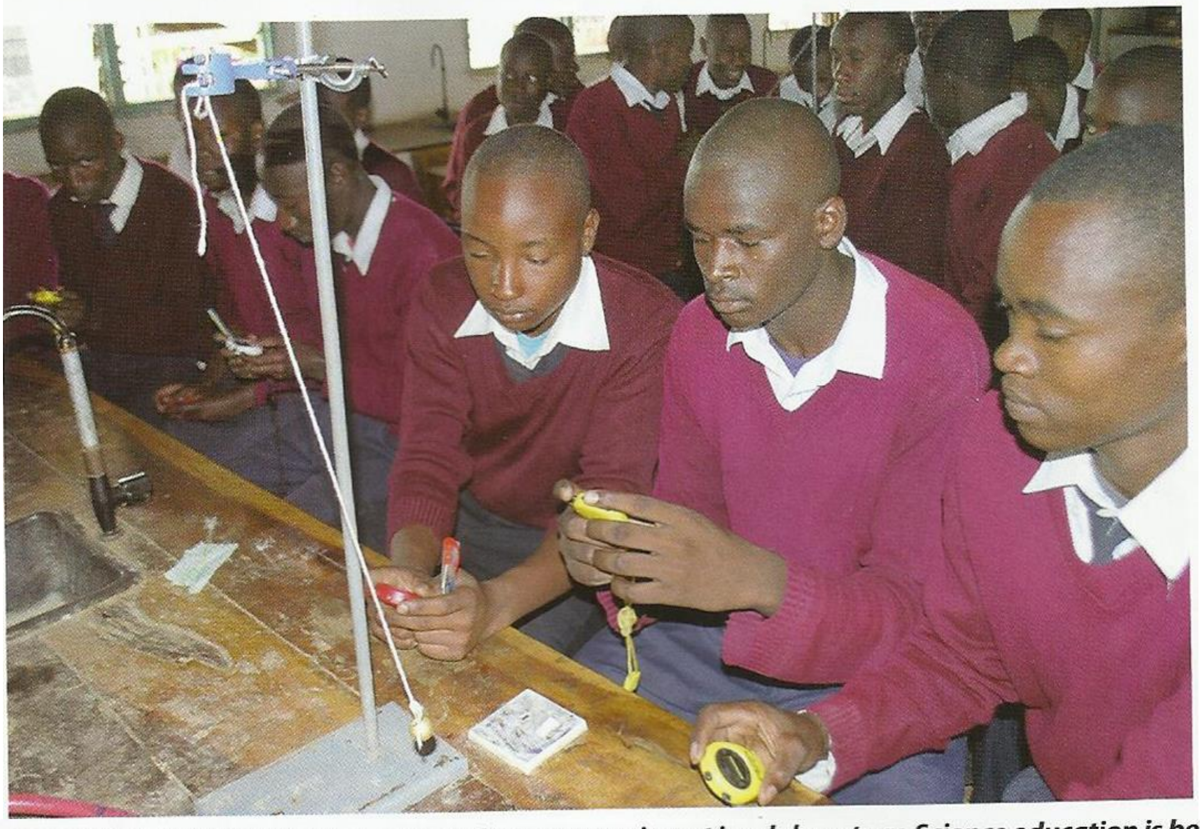
Figure 1: Lines of communication in a Laboratory Management Structure

Source: Adeloye and Chendo (2013).

Physics teachers are expected to request apparatus to be used by students early enough to avoid any inconveniences. Laboratory technicians are required to provide the facilities to the students before class experiments or teacher demonstrations starts. Laboratory technicians should collect the apparatus immediately students are through with the class experiment to ensure order. Any breakages should be communicated immediately to the teacher and head of department for replacement. The technicians should also provide annual report on laboratory equipment and materials. It is management's responsibility to ensure that laboratory technicians and physics teachers are competent in their work at all times. School managers can ensure this by organizing in-service courses and workshops for teachers regularly to get them acquainted with new developments in laboratory based teaching and management (Wango, 2009). However, in Kenyan context, there is limited literature on the influence of organization of laboratory facilities on students' achievement in physics in public secondary schools and therefore the need for the current study.

2.5.3 Coordination of the Physics Laboratory Facilities

Coordination refers to the students' performance of class experiments without clashing. Amuka, Olel, Frederick and Gravenir (2010) argue that practical work in science subjects must be organized in a systematic manner. Dahar and Faize (2011) assert that laboratories facilitate meaningful learning only when the activities are in harmony with the learning objectives of that particular session. Only then can they be able to construct their knowledge of phenomena and related scientific concepts. Figure 2 shows students conducting a well-coordinated class experiment in the laboratories.



PRACTICAL LEARNING: Students conduct an experiment in a laboratory. Science education is being seen as one of the avenues to realize Vision 2030.

Figure 2: **Students Conducting Physics Experiment in a Laboratory**

Note: Consent was sought from the school and students appearing in Figure 2 in adhering to ethical considerations of research.

Figure 2 shows the students actively involved in the physics practical. Students consent was sought to take their photograph for the study. Students are making their observation as well as recording the time using a stopwatch while in the Physics laboratory. It was however noted that there had been no study conducted in Kenya on the influence of coordination of laboratory facilities on students' achievement in physics in public secondary schools and therefore necessitated the carrying out of the current study.

2.5.4 Leadership in Physics Laboratory Facilities

It is widely accepted that school and instructional leadership directly influence the quality of instruction and students' academic performance. A qualified teacher is one who can provide an environment that allows students to attain potential, disseminate effectively physics instructions and develop students intellectually in confronting challenges that require physics reasoning (Aderonmu & Obafemi, 2015). Leadership is defined as the act of leading a group of people or an organization by establishing a clear vision, sharing it with others so that they follow willingly (Ulela, 2015). Instructional leadership on the other hand is the dynamic delivery of the curriculum in the classroom through strategies based on reflection, assessment and evaluation to ensure optimum learning. Leadership in a laboratory setting is provided by subject teacher. It involves planning for learning activities, sourcing the required resources and organizing experiments. In addition to these are guiding students through experiments and promoting a climate in the laboratory that is conducive to learning (Gerring, 2016). As the leader, the teacher must always interact with students in a way that is appropriate, provide needed information, and be courteous. According to Aderomu and Obafemi (2015) such a relationship encourages and motivates students, and this positively affects their academic learning. However, no study has been conducted in Kenya context to establish the influence of leadership in the laboratory on students' achievement in physics in public secondary schools and therefore the need for the current study.

2.5.5 Controlling of the Physics Laboratory Facilities

Control of laboratory facilities involves the proper maintenance of the science facilities to provide of a healthy and safe working environment in the laboratory. Orunaboka and Nwachukwu, (2012) indicate that the procedures for caring for facilities, equipment and supplies should be routinized so that repairs are provided as needed. According to WHO (2011), it is important that all facilities such as benchtops and floors of the laboratory are cleaned and maintained on a regular basis. Management should also ensure adequate supply of appropriate safety equipment such as fire extinguishers and blankets, waste disposal supplies and equipment and first aid equipment. Gloves should be worn in all instances, and should be available to laboratory staff on a routine basis. Laboratory coats must be worn at all times for body protection. Despite WHO (2011) providing control and safety measures for laboratory facilities, no study had been carried out to establish whether the control of the laboratory facilities affected the performance of students in Physics practical examinations and therefore a conceptual research gap for the current study.

Oluwasegun, Ohwofosirai and Emagbetere (2015) noted that the chemicals, materials, equipment and services involved in physics laboratories make them a ‘danger area’ under health and safety regulations. Rules must therefore be put in place to minimize individual risks, and safety equipment should be used to protect the laboratory users from injury or to assist in responding to emergencies (Matson, 2007). According to Lavy and Bilbo, (2009), facility audits must be performed regularly to ensure this. Poor indoor air quality can affect student and teacher performance by causing eye, nose, and throat irritation, fatigue, headache, nausea, sinus problems, and other illnesses. Effects of poor air circulation can be reduced by use of good drainage system and ventilation and storage of toxic such as mercury and radon and noxious supplies in areas with adequate exhaust systems, a proper maintenance (Motz, Biehle & West, 2007). However, the reviewed student were descriptive in nature for they failed to establish the link between the control for laboratory facilities and the academic achievement in Physics practical test. The relationship between the two variables remained unknown and therefore the need to carry out the current study that provided a link between control for laboratory facilities and the academic achievement in Physics practical test.

Maintenance of school facilities has been cited as one of the factors that influence implementation of curricula (Uko & Ayuk, 2015; Lawanson & Ngede, 2011). According to Asiabaka, (2008) facility maintenance entails providing clean and safe environment for teaching and learning. It also ensures provision of adequate facilities for teaching and learning. Maintenance should be well planned for it to achieve its objectives of ensuring that facilities are available whenever required. The plan should of comprises emergency, routine, preventive, predictive, corrective and deferred maintenance (Xaba, 2012). Emergency maintenance is concerned with the repair or replacement of facility components or equipment requiring immediate attention because the functioning of a critical system is impaired or because health, safety or security of life is endangered (Motz, Biehle & West, 2007). Routine maintenance refers to the repair, replacement and general upkeep of tools, equipment, grounds and buildings. The reviewed studies linked control of laboratory facilities to the safety of students and learning environment and therefore a conceptual research gap in establishing the influence of control of laboratory facilities on students achievement in physics in public secondary schools in Njoro sub-county.

Preventive maintenance according to Xaba, (2012) is perhaps the most important category of facilities maintenance, is crucial for ensuring that equipment is always in good working order, and provides safety for learners and educators. Predictive maintenance forecasts the failure of equipment based on age, user demand and performance measures. This kind of maintenance is rooted in the proper execution of a facilities audit, which aims to assist schools in avoiding emergencies and dramatically reduces damage. Corrective maintenance addresses deficiencies that inevitably result from unforeseen events like vandalism, lightning strikes, hail and flooding but excludes activities that expand the capacity of an asset or upgrade the asset to serve needs greater than or different from those originally intended (Grasmick, Hall, Collins, Maloney & Puddester, 2008). Deferred maintenance includes scheduled activities that are delayed or postponed for reasons such as lack of funds or personnel, changes in priorities and use and has merit when a school facility is non-performing or under-performing and when cash preservation is critical. The reviewed studies were descriptive in nature and therefore failed to provide a relationship between control for laboratory facilities and the performance of students in Physics practical test and hence a methodological research gap.

It has been established that a proper maintenance culture ensures that equipment last longer, provide a healthier and safer environment, is less costly to run, and provides a more satisfying experience to users (Orunaboka & Nwachukwu, 2012). The Public Procurement and Disposal Act 2005 (Republic of Kenya, 2009) have recognized the importance of maintenance in learning institutions. The Act recommends that all educational capital equipment should be subject to a preventive maintenance programme as well as repairs to ensure prolonged operational efficiency of the equipment. In case an existing procurement contract does not cater for maintenance and servicing, the procuring entity should appraise and register service providers after establishing that they have proven technical expertise to maintain the equipment. However, there had been no study carried out to show the effect of the Public Procurement and Disposal Act that provides for control and maintenance of laboratory facilities on the performance of students in Physics practical test and therefore a methodological research gap.

2.6 Management of Laboratories Facilities and Achievement in Physics

Practical physics constitutes an important aspect of teaching the subject. This is because a deeper understanding of the nature and processes of physics can only be achieved through laboratory activities which encourage active participation that serve to develop critical thinking (Pollock &Finkelstein, 2010). Modern trends in education emphasize laboratory activities and experiments, because the laboratory is associated with science topics that entail practical laboratory experiments, on the one hand, and the accomplishment of the objectives of science teaching (El-Rabadi, 2013). According to Olufunke (2012), learning of physics is only effective when adequate laboratory facilities are provided as it entails both theory and practical and the two must be satisfied before physics is said to have been properly taught. Oladejo *et al* (2011) urges that success of students in physics depends on proper interaction between the teacher, the students and laboratory facilities. In adopting laboratory based methods, a teacher is expected to organize and structure instructional materials, select the experiments and subtly direct the activities so as to stimulate the learners towards meaningful understanding of physics.

Lunenburg (2010) noted laboratory work enhances students' performance as it elicits interest in the topics of discussion. Well-planned and organized experimental activities enhance students' knowledge and science process skills through activities such as analysis, synthesis, demonstration and prediction. Knowledge and science process skills cannot be properly attained without effective use of the science laboratory and experimentation. The laboratory plays a major role in the realization of the intellectual, emotional and psychomotor objectives of science teaching. A study by Lunenburg (2010) focused on the management of laboratory facilities and the realization of the intellectual, emotional and psychomotor objectives of science teaching while the current study sought to establish the influence of management of laboratory facilities on students' academic achievement in physics and therefore a conceptual research gap that the current study sought to fill.

A study by Morgan (2009) showed that the condition, adequacy and effective management of educational facilities had a stronger effect on the overall performance of students than the combined influences of the family background, socio-economic status, and school attendance and learners behaviour. A study by Morgan (2009) focused on the overall performance of students while the current study focused on the performance of students in physics practical test and therefore a conceptual research gap that was filled by this study. Bello (2011) on the other hand observed that the laboratory work affects students' scientific attitudes, thought and mental faculties when it is well coordinated and managed. Students who use scientific thinking strategies and laboratory skills attain higher grade than those taught in the traditional methods. A study by Bello (2011) provided a conceptual research gap for the management of laboratory facilities was linked to students' scientific attitudes towards the taught subject while the current study links management of laboratory facilities to academic performance of the subject.

A study conducted by Adeyemo (2012), showed that students taught using laboratory experimental methods performed better than their counterparts taught using traditional ones did. This study attributed the high achievement of the experimental group to laboratory work as it enhanced the development of the student's scientific and practical skills. It also led to the higher retention of physics concepts and ability to recall them when needed. The method motivated the students and fostered the spirit of competition among them as reflected in their achievement scores. While the study by Adeyemo (2012) focused on teaching methods, the current study focused on the influence of management of laboratory facilities on the academic achievement of students in Physics and therefore a conceptual research gap that this study filled.

The results of Adeyemo's (2012) work corroborates the findings of Olatunbosun (2008) who found that exposure to well-planned and organized laboratory work positively affects performance of students. This is true as exposure to well-equipped and organized laboratory practicals helps students to understand and recall what they see and hear better. Olatunbosun (2008) was done in Nigeria while the current study was done in Kenya and due to education differences in the two countries, there was a need to fill this contextual research gap by carrying out a study in Kenyan context. Olufunke (2012) concluded that science laboratory is a critical variable in determining the learning outcomes in secondary schools.

2.7 Theoretical Framework

This study is grounded on Fayol's Administrative theory. Fayol's (1841–1925) Administrative theory indicates that all managers perform five functions: Plan, organize, coordinate, command/Lead and control (Okumbe, 2009). The theory's five functions have been contextualized to suit this study as follows: Planning for the physics laboratory facilities involves the use of a checklist in making inventory of the available physics equipment, quality, storage state and arranging to purchase the best instrument for as per the students. Follow up is required on the immediate supply of the equipment. Organization in the context of a quality management model refer to the staff management structure of the physics laboratory facilities and their responsibilities. Coordination involves the actual performance of the physics practical and ensuring that the activities do not crash.

Leadership of the physics teachers and the laboratory technicians enhances their ability to influence and direct students to act purposively towards achievement in physics learning. That is to be customer-focused. Understanding the strengths and weaknesses of the students and teachers requires exceptional interpersonal skills and the ability to motivate Control. Controlling of the physics laboratory facilities involves the safety and the maintenance of physics laboratory facilities

Fayol's Administrative theory is relevant to the study because it is concerned with MLF and focuses on the management aspects of planning, organizing, coordination and leadership.

2.8 Conceptual Framework of the Study

A conceptual framework is a diagrammatic model that depicts the interrelationships among variables (Orodho, 2009). The framework was modelled along the objectives of the study and the theories on which they were grounded. The diagram depicts the relationship among the variables of the study. The variables of the study are MLF as expressed by its five components; planning, organizing, coordination, leadership and controlling and physics achievement.

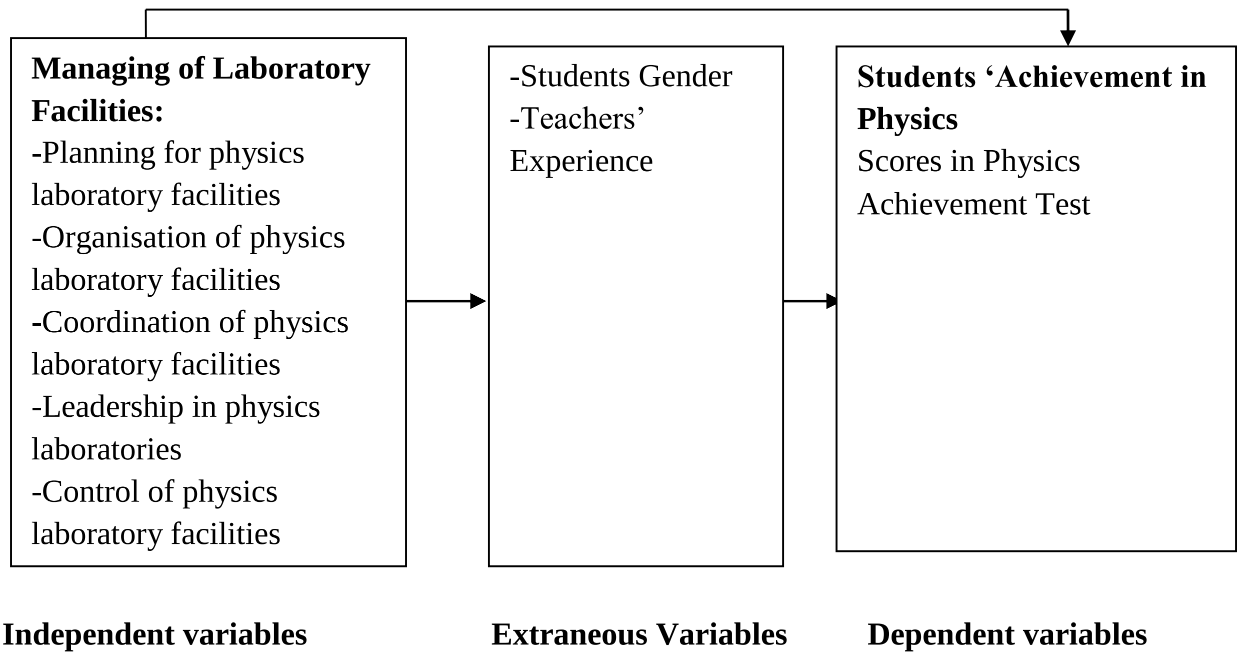


Figure 3: Conceptual Framework Showing the Relationship among Variables

Figure 3 indicates that MLF was the independent variable while students' physics academic achievement was the dependent variable. Management of laboratory facilities was measured by the five elements of management: planning, organisation, coordination leadership and control of laboratory facilities. Planning of laboratory facilities was measured in terms of its availability, storage state and purchases done. Organization of laboratory facilities on the other hand was measured in terms of staff structure, their roles and training. Leadership was measured by the extent in which guidance and direction in doing the Physics practical was done. Coordination was evaluated in terms of the scheduling of the physics practical in the laboratory and the Physics teacher in charge. Control of laboratory facilities was measured by assessing the state of health and safety of students while in the laboratory. The students achievement in physics was measured by the students score in the achievement test.

The study used student's gender and teachers' experience as extraneous variables. The effects of the extraneous variables were controlled through sampling of the co-educational secondary schools and working with the departmental heads of physics in each school. To control for the teachers' experience, the study sampled physics teachers with a teaching experience of at least 5 years. It is expected that a five year teaching experience exposes the teacher to many practical in the laboratory and therefore is able to offer good guidance and direction to the students in the laboratory while doing Physics practical. Their effects were reduced further through randomization. Miller and Whicker (2017) have recommended it as one of the best methods of minimizing the effects of extraneous variables as it ensures that any association between dependent and independents variables is not attributed to chance.

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the research design, location and population of the study, sampling procedures and sample size. It also presents the research instruments, data collection and analysis techniques.

3.2 Research Design

This study used cross-sectional research design. Cross-sectional research design is a research design that measures possible relationship between study variables at the same point in time. It is descriptive in nature and therefore no causal(Creswell, 2014). Using cross-sectional research design, a study can make inferences about the population of a given study(Mehdi, 2016). The advantage of cross-sectional research design is that it allows variables to be investigated in their natural setting and without manipulation(Fischer, 2016). The investigation and comparison between variables are done at the same time and therefore can be used within a limited time scope as it was the case in this study(Kunisch, Menz, Bartunek, Cardinal, & Denyer, 2018).

3.3 Location of the Study

The study was conducted out in Njoro Sub County in Nakuru County, Kenya. Njoro sub county borders Rongai Sub County to the North, Nakuru and Naivasha Sub Counties to the East, Narok district to the South and Molo and Kuresoi Sub Counties to the west. The Sub County had 35 public secondary schools and 8229 students (DQASO Njoro Sub-County, 2017). It was selected because students' achievement in physics had been unsatisfactory over the last four years. For example, the students achievement index in the subject for the years 2012 to 2015 ranged between 4.24 to 5.24 out of a maximum of 12 (KNEC, 2016).

3.4 Population of the Study

According to Kultar (2014), the target population of a research comprises all the elements (individuals, subjects, animals, things) that are likely to be affected by the outcome of an investigation in a given environment. The target population defines those units for which the findings of the study is meant to generalize (Asiamah, Mensah & Oteng-Abayie, 2016). The target population of the study comprised of all the 8229 secondary school students and 60 physics teachers in Njoro Sub County. The accessible population was all the 60 physics teachers and 2385 form two students in the 35 public schools in sub county (DQASO Njoro Sub-County, 2016). A summary of the accessible population by administrative division is given in Table 5.

Table 5:

Accessible Population of the Study by Division

Division	**Physics Teachers**	**Form 2 Students**
Mau Narok	11	377
Njoro Central	23	757
Kihigo	9	671
Lare	10	239
Mauche	7	341
Total	60	2385

Source: Field Data (2017)

3.5 Sampling Procedures and Sample Size

Sampling is the process of choosing elements of the target population that will participate in a study in such a way that they represent it (Creswell, 2014). This is because in most cases it is usually not possible to involve all members of the target population in a study thus the need for sampling (O'Gorman & MacIntosh, 2014). The purpose of sampling is to secure a representative group which will enable the researcher to gain information about an entire population when faced with limitations of time, funds and logistics (Mugenda & Mugenda, 2003). The number of form two students who participated in the study was determined using Slovin's formula (Dionco-Adetayo, 2011). The formula is given below;

$$n=\frac{N}{1+N(e^2)}$$

Where: n = sample size

N = population size

e = margin of error or error tolerance

On application of the formula;

$$n=\frac{N}{1+N(e^2)}$$

$$n=\frac{2385}{1+2385(0.05^2)}$$

$$n=\frac{2385}{1+2385(0.0025)}$$

$$n=\frac{2385}{1+5.9625}$$

$$n=\frac{2385}{6.9625}$$

n=342.5494

Therefore the sample size for the form two students was 343 students. The study used stratified random sampling in selecting the 343 students from the five division in Njoro Sub-County. Therefore the five divisions formed the strata which in this study used as the stratification criteria. Stratified random sampling ensures that there is no biasness of representation and therefore ensuring that the study findings can be generalizable to the study population (Latunde, 2017). Using stratified random sampling, the study ensured that all the division in the Njoro Sub-county were fully represented in the sample and therefore the results were generalizable to the entire Njoro Sub-County. Table 6 show the sampling of students.

Table 6:

Sampling of Students in Co-Educational School

Division	**Form 2 Students**	**Sampling Ratio**	**Sample**
Mau Narok	377	0.158	54
Njoro Central	757	0.317	109
Kihigo	671	0.281	97
Lare	239	0.100	34
Mauche	341	0.143	49
Total	**2385**	**0.143**	**343**

In sampling physics teachers, Slovin's formula was further used as follows;

$$n=\frac{N}{1+N(e^2)}$$

$$n=\frac{60}{1+60(0.05^2)}$$

$$n=\frac{60}{1+60(0.0025)}$$

$$n=\frac{60}{1+0.15}$$

$$n=\frac{60}{1.15}$$

n=52.51739

Similarly, stratified random sampling was used in selecting 52 physics teachers from a population of 60 physics teachers. Table 7 shows the sampling of physics teachers.

Table 7:

Sampling of Physics Teachers

Division	**Physics Teachers**	**Sampling Ratio**	**Sample**
Mau Narok	11	0.183	10
Njoro Central	23	0.383	20
Kihigo	9	0.150	8
Lare	10	0.167	9
Mauche	7	0.117	6
Total	60	**0.833**	**53**

From each of the divisions, the study purposively selected 2 co-educational schools to participate in the study. A careful consideration was made to ensure that the schools selected presented the following three categories of schools; sub-county schools, county schools and extra county schools and that both Day secondary schools and Boarding secondary schools participated in the study.

3.6 Research Instruments

Three research instruments namely; Students Physics Practical Achievement Test (SPPAT), Physics Teachers Laboratory Facilities Management questionnaire (PTLFMQ) and

Laboratory Facilities Observation Checklists (LFOC) were used to collect data. Students' achievement in physics was measured using data generated by SPPAT which was dichotomous with students either scoring one or zero. The test consisted of two sections A and B. Section A was used to gather the students bio-data while section B had test items on topics; Measurement II, Turning effect of force and Hooke's' law. Items in section B were from Kenya National Examinations Council (KNEC) past examination papers and modified to suit this study. The topics involved experimental activities that require use of physics laboratory facilities. PTLFMQ comprised two sections with the first generating data on the physics teachers' characteristics.

The second section generated data on five aspects of managing laboratory facilities namely; planning, organizing, leadership, coordination and controlling. The items in PTLFMQ were constructed using close ended multiple-choice items based on a 5 point Likert scale (1= Very Poor, 2=Poor, 3=Average, 4=Good, 5=Very Good). LFOC captured data on the availability/adequacy of apparatus/equipment (voltmeters, magnets, mirrors, springs etc.) in the laboratories. The availability/adequacy of the apparatus/equipment were rated on a five point scale (0=Not Available, 1=Inadequate, 2=Somehow Adequate, 3=Moderately Adequate, 4=Adequate) The instrument was also used to elicit data on the condition of the laboratories with respect to painting, internal fittings like furniture, water, lighting ventilation among others. The physical condition of the fittings were also rated using a 5 point Likert scale (1= Very Poor, 2=Poor, 3=Average, 4=Good, 5=Very Good).

3.6.1 Validity of the Research Instruments

Validity is concerned with how accurate the data obtained represents the variables of the study and its true reflection of the variables, it is only then that inferences based on such data would be accurate and meaningful (Creswell, 2014). The content and face validity of PTLFMQ and LFC were examined by five research experts in the department of Curriculum, Instruction and Education Management of Egerton University, Njoro. Five experienced secondary school physics teachers who are KNEC physics examiners reviewed the validity of SPPAT. The suggestions made by the experts improved the instruments before the actual study.

3.6.2 Reliability of the Research Instruments

Reliability refers to the degree to which an instrument yields consistent results or data after repeated trials (Briggs, Coleman, Morrison, Dixon, & Woolner, 2016). Reliability tests enable a researcher to check the items in a data collection tool and clear any ambiguities in it before it is used(Clements & Sarama, 2016). PTLFMQ and LFC were pilot-tested in an extra count school in Njoro Sub-County which was not part of the study. Cronbach Alpha method estimated the reliabilities of PTLMQ and LFC which were on likert scale. This is because it was appropriate as it tests a tool administered only once and has close-ended items (Sloan & Quan-Haase, 2017). The computation of the reliabilities were computed using Statistical Package for Social Sciences (SPSS-22) and results presented in Table 8.

Table 8:

Cronbach's Reliability Analysis

Instrument	Cronbach Alpha
PTLFMQ	0.933
LFC	0.801

The reliability of SPPAT which was dichotomously scored was estimated using the Kuder Richardson 21 (KR-21) formula.

$$\text{K-R21 reliability coefficient} = \frac{K}{K-1}\left[\frac{1 - M\,(K-M)}{1-KS^2}\right]$$

Where K = Number of test items

M = Mean of the scores

S = Standard deviation of the set of test scores

Gall, Borg and Gall (2007) recommend the use of K-R21 formula when an instrument is piloted once and generates data at interval or ratio scale. For the SPPAT interment, mean of the scores was 5.56 (M=5.56) and the standard deviation of the set of test scores was 2.11(SD = 2.11). Given the 23 items used, the computation of the K-R21 reliability coefficient was as follows;

K-R21 reliability coefficient $= \frac{23}{23-1}\left[1 - \frac{5.56\ (23-5.56)}{1-23S^2}\right]$

$$\text{K-R21}=\frac{23}{22}\left[\frac{95.9664}{101.3209}\right]$$

$$\text{K-R21}=1.0455\left[\frac{95.9664}{101.3209}\right]$$

$$\text{K-R21}=0.988$$

The SPPAT yielded a reliability coefficient of 0.988, while PTLFMQ and LFC yielded reliability coefficients of 0.933 and 0.801 respectively. Kearney (2016) recommended reliability coefficients of above the 0.7 threshold. Therefore the research instruments were considered reliable and therefore they were adopted for the study.

3.7 Data Collection Procedures

The researcher sought an introductory letter from the Graduate school of Egerton University to enable her seek a permit from the National Commission for Science, Technology and Innovation (NACOSTI). The permit granted conduction of study from the Nakuru County Director of Education and Njoro sub county Education Officer. The researcher then formally contacted the physics teachers through their respective principals, explained to them the purpose of the study, and sought their cooperation. Thereafter, dates, venues and times for administering SPPAT and PTLFMQ, and checking the condition of the facilities in the laboratories were set in consultation with the physics teachers. The physics teachers assisted in administering the test and filling in the questionnaires as well as in assessing the condition of the facilities. Thereafter, the collected data was organized per division and prepared for analysis. All ethical considerations were adhered to throughout the study period.

3.8 Data Analysis

Data generated by SPPAT, PTLFMQ and LFOC were checked for incompleteness, inconsistencies, errors and cleaned. Statistical Package for Social Sciences (SPSS-22) was used for data entry and analysis. Frequencies, percentages, mean and standard deviations described and summarised quantitative data. Simple linear regression tested the five study hypotheses at the 0.05 level. Simple linear regression was ideal for establishing causal relationships between variables. It also explains the power of each independent variable in accounting for variations in the outcome (Cronck, 2014). A multiple regression was used to show how the five independent variables cumulatively predict the dependent variable of the study (Field, 2013). Table 9 gives a summary of the statistical tests used in analysing data.

Table 9:

Summary of Data Analysis

Hypothesis	Independent	Dependent	Statistics
H_o1: Planningfor laboratory facilities has no statistically significant influence on students achievement in physics	Planning for physics laboratory facilities	Scores in Students'' Physics Practical Achievement Test	Frequencies Percentages, Mean Standard deviation, Simple and multiple linear regression
H_o2: Organization of physics laboratory has no statistically significant influence on students' achievement in physics	Organisation of physics laboratory	Scores in Students'' Physics Practical Achievement Test	Frequencies Percentages, Mean Standard deviation, Simple and multiple linear regression
H_o3: Coordination of laboratory facilities has no statistically significant influence on students' achievement in physics	Coordination of physics laboratory	Scores in Students'' Physics Practical Achievement Test	Frequencies Percentages, Mean Standard deviation, Simple and multiple linear regression
H_o4: Leadership in the laboratory has no statistically significant influence on students' achievement in physics	Leadership in the laboratory	Scores in Students'' Physics Practical Achievement Test	Frequencies Percentages, Mean Standard deviation, Simple and multiple linear regression
H_o5: Control of laboratory facilities has no statistically significant influence on students' achievement in physics.	Control of physics laboratory	Scores in Students'' Physics Practical Achievement Test	Frequencies Percentages, Mean Standard deviation, Simple and multiple linear regression

CHAPTER FOUR
RESULTS AND DISCUSSIONS

4.1 Introduction

This chapter presents the results and discussion of the study. The purpose of the study was to establish the influence of planning, organizing, coordination, leadership and control of laboratory facilities on secondary school students' academic achievement in physics. The results are presented in five main sections within the context of the five objectives in chapter one. The chapter begins by presenting a summary of the profiles of the respondents. It then examines the influence of planning, organizing and coordination of laboratory facilities on students' academic achievement in physics. The chapter ends by establishing the influence of leadership and control of laboratory facilities on achievement.

4.2 Profile of the Respondents

The study examined the characteristics of those who participated in the study. Kipkebut (2010) asserts that biographical variables provide the context in which data was gathered. Kipkebut (2010) further assert that an appreciation of the context enhances understanding of information gathered during a study. Physics teachers were asked to indicate the number pf years they had taught physics in their current school. A summary of the duration the physics teachers had been in their respective schools was recorded in Table 10.

Table 10:

Duration (in years) as a Physics Teacher in the School (n = 48)

Duration	**Frequency**	**Percent**
4 Years and below	19	39.6
5 to 9 years	25	52.1
10 years and above	4	8.3

Table 10 shows that majority (52.1%) of the teachers had been in their workstations for between 5 to 9 years while the rest had been in the work places for 4 years and below (39.6%) and 10 years and above (8.3%) respectively. The mean duration of the physics teachers in the schools was 5.52 (SD = 2.90) years. This implied that teachers on average had a good understanding of the laboratory facilities in the current school and therefore the information given in this study were reliable.

The study also established whether the schools involved in the study had laboratories before testing the hypotheses. This was good practice to examine availability of facilities before establishing how they are managed (Lunenberg, 2010). The responses of the physics teachers on whether their schools had physics laboratories are on Table 10.

Table 11:

Availability of Physics Laboratories in Schools

Response	Frequency	Percent
Yes	15	31.3
No	33	68.7

The results in Table 11 indicate that more than two thirds (68.7%) of the teachers were from schools that did not have physics laboratories while nearly a third (31.3%) were from schools that had physics laboratories. The results indicate that many schools teach physics but do not have laboratories. Absence of physics laboratories may affect the performance of students in Physics practicals an in Physics subject in general. The results support those of Adeyemo (2012) who noted that majority of schools in Nigeria, which teach physics lack laboratories and basic facilities. Makanda (2015) also noted that lack of facilities was a major impediment to provision of quality science education in most schools in Kenya. Ofulunke (2012) noted that availability of a science laboratory with adequate equipment is a critical variable in determining the quality of output from senior secondary school Physics. Lawanson *et al.*(2011) asserts that the quality of education that our children get depends largely on availability of physical facilities and the environment where the learning takes place.

4.3 Physics Laboratories Equipment/Apparatus in Schools

The researcher also assessed the status of physics laboratory equipment in the schools prior to testing the study hypotheses. The assessment was necessary because it enabled the study rate the facilities in schools at the time of the study. Data on the status of physics equipment and apparatus in the laboratories was gathered using the laboratory facilities checklist. The researcher visited the schools involved in the study and rated the adequacy of equipment and apparatus in the laboratories. The rating was done in terms of their numbers of the equipment/apparatus and those of the students, and their serviceability. A five point Likert scale (Not Available=0, Not adequate =1, Somehow Adequate =2, Moderately Adequate=3, Adequate=4) was used to rate the adequacy of equipment and apparatus in the laboratories. The adequacy of the facilities is summarized in Table 12.

Table 12:

Adequacy of Apparatus/Equipment in Public Secondary Schools in Njoro Sub-County

Apparatus/ equipment	**n**	**Adequate (%)**	**Moderately adequate (%)**	**Somehow adequate (%)**	**Not adequate (%)**	**Not available (%)**
Voltmeters	30	16.7	80.0	-	3.3	-
Ammeters	30	20.0	76.7	-	3.3	-
Rhoestats	30	6.7	36.7	50.0	3.3	3.3
Milliameters	29	17.2	69.0	10.3	3.4	-
Switches	29	13.8	62.1	20.7	3.4	-
Connecting wires	29	27.6	55.2	13.8	3.4	-
Lenses	30	26.7	60.0	10.0	-	3.3
Glass blocks	30	30.0	63.3	-	-	6.7
Mirror	30	16.7	46.7	33.3	-	3.3
Prism	30	30.0	60.0	3.3	-	6.7
Pins	30	23.3	40.0	33.3	-	3.3
Lense holder	30	20.0	73.3	3.3	-	3.3
Masses	29	10.3	86.2	-	-	3.4
Spring	30	6.7	36.7	50.0	6.7	-
Metre rulers	30	20.0	66.7	10.0	3.3	-
Magnets	29	3.4	41.4	51.7	-	3.4
Charts/photos	29	3.4	6.9	51.7	20.7	17.2
Carolimeters	30	6.7	30.0	20.0	30.0	13.3
Burners/heaters	30	6.7	63.3	20.0	6.7	3.3
Thermometers	30	16.7	66.7	13.3	3.3	-
Veniercalipers	30	13.3	43.3	40.0	3.3	-
Micrometer screw gauge	30	13.3	43.3	36.7	6.7	-
Clampstand	30	10.0	76.7	6.7	6.7	-
Stop watches	29	10.0	70.0	20.0	-	-
Beam balance/	29	6.9	27.6	41.4	13.8	10.3

Apparatus/ equipment	n	Adequate (%)	Moderately adequate (%)	Somehow adequate (%)	Not adequate (%)	Not available (%)
electronic balance						
Pinhole camera	29	3.4	-	27.6	31.0	37.9
Spring balance	30	6.7	40.0	30.0	20.0	3.3
Slinky balance	28	3.6	10.7	17.9	17.9	50.0
Ripple tank	30	-	10.0	3.3	20.0	66.7
Capacitors	30	6.7	33.3	33.3	16.7	10.0
Composite Scores		**11.1**	**46.3**	**25.7**	**13.8**	**16.6**

The results in Table 12 indicate that for items such as voltmeters (97.6%), glass blocks (93.3%), lenses (86.7%) and milliametres (86.2%) were adequate (adequate and moderately adequate) in nearly all the schools. The results also indicate that there were areas the equipment/apparatus were not available at all or whatever was available was not adequate. For instance, two thirds (66.7%) of the schools did not have ripple tank while slinky balance was not available in a half (50%) of the schools. Table 9 also indicates that items like Charts/photos (72.4%), pin hole cameras (57.6%), springs (56.7%) and beam balance (55.2%) were rated as inadequate. Generally, the apparatus in the laboratories were considered adequate given majority (63.3%) of the 30 items that were assessed were rated so. The results further imply that students had adequate equipment and apparatus to enable them perform class experiments.

The findings in the current study disagrees with earlier studies of Olufunke (2012) who found out that laboratory adequacy affect the performance of students. Students tend to understand and recall what they see more than what they hear (Aderomu & Obafemi, 2015). Aderomu and Obafemi (2015) established that there exists a significant relationship between the provision of laboratory facilities and their academic achievement in physics. Availability of laboratories and laboratory facilities contribute to student's good academic achievement. This is because laboratory classes motivate and enable students achieve superior academic goals and at the same time attain hierarchy of learning science. Data on the condition of laboratories was also gathered using the laboratory facilities check list. The condition of the laboratories was established by examining their physical state with regard to ventilation, lighting and the condition of the painting and fittings. A five point scale, namely; Very Poor

(1), Poor (2), Fair (3), Good (4), Very Good (5), was used to rate the condition of each item. A summary of the condition of the laboratories is given in Table 13.

Table 13:

Condition of Laboratories

Item	n	Very Good	Good	Fair	Poor	Very Poor
Benches	29	13.8	69.0	10.3	3.4	3.4
Stools	30	6.7	80.0	6.7	-	6.7
Floor	30	10.0	36.7	36.7	10.0	6.7
Windows	29	6.9	41.4	41.4	6.9	3.4
Wall	30	13.3	46.6	36.7	-	3.3
Roof	30	6.7	43.3	43.3	3.3	3.3
Painting	29	-	44.8	20.7	13.8	20.7
Lighting	30	6.7	63.3	10.0	6.7	13.3
Electric switches	30	6.7	40.0	13.3	13.3	26.7
Gas taps	30	3.3	43.3	20.0	20.0	13.3
Water taps	29	-	37.9	31.0	13.8	17.2

The results in Table 13 indicate that 5 out of the 11 items that were used to measure the condition of the laboratories were rated as good. These were benches (82.8%), stools (86.7%) Walls (59.9%), roofs (50.0%) and lighting (70.0%). The other items rated fair and below with poorest condition being paintings (55.2%), floors (53.4%), electrical switches (53.3%) and water taps (53.3%). Based on the results the condition of the laboratories were rated as poor. The results suggest that secondary schools in Njoro Sub-County do not regularly maintain their laboratories. The condition of the laboratory provides the environment for students to utilize the laboratory equipment and apparatus. The results are in agreement with Lawanson *et al.* (2011), who found out that the quality of education that students get depends to a large extent on the condition of physical facilities and the environment where the learning takes place. These factors may motivate or demotivate students towards learning and therefore affecting the student achievement in academics.

4.4 Influence of Planning for Laboratory Facilities on Students Achievement in physics

The first objective of the study sought to examine the influence of planning for laboratory facilities on students' achievement in physics. The hypothesis tested on planning for laboratory facilities and its significant influence students' achievement in physics. The results of the examination were presented in the subsequent paragraphs. Data on planning was generated using 7 items in section B of the physics teacher laboratory facilities management questionnaire. The variable was measured using a set of seven closed-ended items. The rating of planning for physics laboratory facilities by physics teachers used five points (Very Poor =1, Poor = 2, Fair = 3, Good = 4, Very Good = 5) scale. A planning laboratories index (overall mean score)was obtained from the average responses of the teachers .The mean scores, their standard deviations and the composite scores are given in Table 14 for the items.

Table 14:

Planning for Laboratory Facilities

Planning Activity	**n**	**Mean**	**SD**
Formulating of objectives of laboratory work	48	3.63	0.67
Conducting laboratory facilities audit (apparatus/equipment/reagents available and their condition)	44	2.93	0.79
Carrying out staff audit (physics teachers and laboratory technicians)	44	2.75	0.78
Preparing a list of resources required for the practicals a calendar year	46	4.04	0.76
Preparing budget for laboratory facilities (acquisition of new facilities, repairs, maintenance)	48	3.98	0.70
Maintenance schedule preparation	48	2.56	0.94
Preparing timetable of laboratory work for the academic year	48	4.13	0.67
Composite Score	**48**	**3.34**	**0.44**

Table 14 shows that the mean of the item on planning for laboratory facilities ranged between 2.56 (SD = 0.94) to 4.13 (SD = 0.67) while the index) (overall mean) was 3.34 (SD = 0.44). An examination of the item means reveal that some of items like "Preparing a list of resources required for the practical in a calendar year (M = 4.04, SD =0.76)" was high while some of items like preparing maintenance schedule (M = 2.56, SD = 0.94)" was low. High item mean is an indication that physics teachers plan well while a low item mean is an indication that the task was unsatisfactory. The performance of planning for laboratory facilities as measured by the composite scores (M = 3.34, SD = 0.44) rated fairly given that it was out of 5. This is an indication that on average there was a good planning for laboratory facilities.

Data on academic performance was generated using the student's physics practical achievement test. According to Levin, Wasanga and Somersetm (2011), academic performance of learners is measured using scores obtained in assignments, examinations and continuous assessment tests. The test had three items scored out of a maximum of 23. The students' performance in the test was summarized in Table 15.

Table 15:

Physics Practical Achievement Test Marks (n = 293)

Physics Practical Achievement Test	**Frequency**	**Percentage**
5 and below	168	57.3
6 - 10	78	26.6
11- 15	39	13.3
16 and above	8	2.7

The results in Table 15 reveal that more than a half (57.3%) of the respondents obtained 5 marks and below in the test. Only a few ((16.0%) of the students had obtained more than 10 marks. Based on these scores, the performance in the test rated very low.The overall mean score in the test was 5.54 (SD = 4.62).The students' performance in the test as measured by the overall mean score was very low given that it was marked out of 23. The standard deviation of the overall mean score was relatively high. This is an indication that the variation in the students' performance was wide; there were low, moderate and high performers.

The influence of planning for laboratory facilities on student's achievement in physics practical test was determined using simple linear regression. The regression procedure was ideal for determining influence of a variable on the other because it explains the power of the independent variable in accounting for variations in the outcome (Cronck, 2014). Planning for laboratory facilities as measured by its index (M = 3.34, SD = 0.44) was regressed on the students' academic achievement in the physics practical test as measured by their overall mean score (M = 5.54, SD = 4.62). Table16 shows the regression of teachers' planning for laboratory facilities in students' achievement in physics practical test.

Table 16:

Regression of Teachers' Planning for Laboratory Facilities in Students' Achievement in Physics Practical Test

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.784[a]	0.615	0.613	0.30376

a. Predictors: (Constant), Planning for Laboratory Facilities

The results in Table 16 gives an R-value of 0.784, R Square value of 0.615, and adjusted R Square value of 0.613 and standard error of estimate of 0.303376. The R value shows the correlation coefficient between the observed values of the dependent variable and the predicted values of the dependent variable (Kombo & Tromp, 2009). Therefore, there was a strong correlation between the observed values of the dependent variable and the predicted values of the dependent variable. R Square value is obtained by squaring the R-value. The R Square value shows the percentage of variation of dependent variable explained by the predictor variable (Shirish, 2012). Therefore 61.5% of the variation in students' achievement in physics practical test can be explained by planning for laboratory facilities. The adjusted R Square shows the percentage of variation in dependent variable explained by the significant predictors on in the regression model (Naissuma, 2009).

On the other hand, the standard error of estimate shows the accuracy of the model whereby a small error shows that the model is more accurate (Saunder, Lews, & Thornhill, 2009).A low standard error of estimate of 0.303376 shows that the regression model is accurate in predicting the students' achievement in physics practical test using planning for laboratory facilities. The error term is used for model correction and therefore included in the regression equation to adjust for model error. Table 17 shows the significance of the model as a whole.

Table 17:

ANOVA for Planning for Laboratory Facilities Model

Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	26.435	1	26.435	286.500	0.000[b]
	Residual	29.988	291	0.092		
	Total	56.423	292			

a. Dependent Variable: Students' Achievement in Physics Practical Test

b. Predictors: (Constant), Planning for Laboratory Facilities

ANOVA was used to test the significance of the model in predicting the students' achievement in physics practical test using planning for laboratory facilities as a predictor variable. According to Table 17, the F-test results are that F(1,291)=286.500 and p-value less than 0.05. This implies that the regression model has statistically significant capacity to predict the students' achievement in physics practical test using planning for laboratory facilities as a predictor variable. Table 18 shows the influence of planning for laboratory facilities on students' achievement in physics practical test.

Table 18:

Regression Coefficient for Planning for Laboratory Facilities

Model		**Unstandardized Coefficients**		**Standardized Coefficients**		
		B	**Std. Error**	**Beta**	**t**	**Sig.**
1	(Constant)	0.247	0.114		2.168	0.031
	Planning for Laboratory Facilities	0.871	0.051	0.784	16.926	0.000

a. Dependent Variable: Students' Achievement in Physics Practical Test

Table 18 shows that for every one-unit increase in planning for laboratory facilities, students' achievement in physics practical test increases by 0.871 units with other factors held constant. This is due to unstandardized beta coefficient of 0.871. Focusing on the p-value for the t-statistic(greater than critical value), planning for laboratory facilities is a statistically significant predictor of students' achievement in physics practical test due to a p-value less than 0.05. Therefore, the first hypothesis stating that planning for laboratory facilities has no statistically significant influence on student's achievement in physics in public secondary schools in Njoro Sub-county was rejected. This therefore implied that planning for laboratory facilities has statistically significant influence on student's achievement in physics in public secondary schools in Njoro Sub-county. The following simple linear regression equation was obtained;

Students' Achievement in Physics Practical Test = 0.247 + 0.871 (Planning for Laboratory Facilities) + 0.30376

This implied that a unit increase in planning for laboratory facilities resulted into 0.871 units increase in student's achievement in physics in public secondary schools in Njoro Sub-county with other factors held constant. The results agree with Dahar and Faize (2011), who asserts that planning for laboratories facilitate meaningful learning especially when the planning is in harmony with the learning objectives of that particular session. Dahar and Faize (2011) adds that if planning for laboratories facilities is done well, students are able to construct their knowledge of phenomena and related scientific concepts.

4.5 Influence of Organizing Laboratory Facilities on Students Achievement in Physics.

The second objective of the study sought to examine the influence of organizing laboratory facilities on student's achievement in physics. Effective laboratory management in teaching-learning situation refers to the ability to maintain harmony and order in such a facility (Levy & Bilbo, 2009). It involves organizing the tools, machines, engines and consumables. Data on organizing laboratory facility was gathered using a set of 10 items in the physics teacher laboratory facilities management questionnaire. The physics teachers responses to the items in the questionnaire were converted into scores using a 5 point scale (Very Poor =1, Poor = 2, Fair = 3, Good = 4, Very Good = 5). The average of the scores was transformed into a composite score (Table 19).

Table 19:

Organising Laboratory Facilities

Responsibility	**N**	**Mean**	**SD**
Defining lines of authority in laboratories (organogram)	47	3.15	0.55
Allocating duties/responsibilities (teachers and technicians) in the laboratory	47	3.26	0.71
Scheduling practicals	46	3.98	0.71
Arrangement (furniture, equipment, apparatus, reagents) of the laboratories	47	3.77	2.79
Labelling facilities	46	3.35	0.99
Overseeing the issuing of facilities to students during practicals	47	4.17	0.67
Facilitating maintenance of facilities	46	2.35	0.85
Arranging in-service courses for staff	47	2.55	0.69
Setting up communication channels (school administration, teachers, technicians, students)	47	3.30	0.72
Setting up health and safety in the laboratory measures	46	2.96	0.87
Composite Scores	**47**	**3.26**	**0.42**

The results in Table 19 reveal the mean scores of the 10 items ranged from 2.35 (SD = 0.85) to 4.14 (SD = 0.67) while the index (overall mean score) was 3.26 (SD = 0.42). The results in the table reveal that the physics teachers performed responsibilities such as "Scheduling practicals" (M = 3.98, SD = 71) and "Overseeing the issuing of facilities to students during practicals (M = 4.17, SD = 0.67) well given the relatively high means. Table 19 further reveals that responsibilities such as "Facilitating maintenance of facilities" (M = 2.35, SD = 0.69); Arranging for in-service courses for staff (M = 2.55, SD = 0.69) and "Setting up health and safety in the laboratory measures" (M 2.96, SD 0.87) were not performed well. The performance of organizing function as measured by the index (M = 3.26, SD = 0.42) was considered fair given that it was rated out of a maximum of 5.

The influence of organizing laboratory facilities on students' performance in the physics practical test was determined using simple linear regression. Organizing laboratory facilities as measured by its index was regressed on the students' scores in the physics practical test. Table 20 shows the regression of teachers' organization for laboratory facilities in students' achievement in physics practical test.

Table 20:

Regression of Teachers' Organization for Laboratory Facilities in Students' Achievement in Physics Practical Test

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.706[a]	0.498	0.496	0.26039

a. Predictors: (Constant), Organizing Laboratory Facilities

As shown in Table 20, R-value is 0.706, R Square value is 0.498, adjusted R-Square value is 0.496 and standard error of estimate is 0.26039. It implies there was an average correlation between the observed values and the predicted values of the students' performance in the physics practical test. R Square value of 0.498 implies that 49.8% of the variation in students' achievement in physics practical test is attributable to the organization of laboratory facilities. A low standard error of estimate of 0.26039 shows that the regression model is accurate in predicting the students' achievement in physics practical test using the organization of laboratory facilities. Table 21 shows the significance of the model as a whole tested using analysis of variance (ANOVA).

Table 21:

ANOVA for Organizing Laboratory Facilities Model

Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	12.783	1	12.783	188.524	0.000
	Residual	22.037	291	0.068		
	Total	34.819	292			

a. Dependent Variable: Students' Achievement in Physics Practical Test

b. Predictors: (Constant), Organizing Laboratory Facilities

Table 21 indicates that the F-test results are that F(1,291)=188.524and p-value less than 0.05. This implies that the regression model has statistically significant capacity to predict the students' achievement in physics practical test using organization of laboratory facilities as predictor variable. Table 22 shows the influence of organizing laboratory facilities on students' achievement in physics practical test.

Table 22:

Regression Coefficient for Organizing Laboratory Facilities

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	**Std. Error**	**Beta**	**t**	**Sig.**
1	(Constant)	1.205	0.073		16.441	0.000
	Organizing Laboratory Facilities	0.445	0.032	0.706	13.730	0.000

a. Dependent Variable: Students' Achievement in Physics Practical Test

Results in Table 22 implies that for every one unit increase in organizing laboratory facilities, students' achievement in physics practical test increases by 0.445units with other factors held constant. This is revealed by unstandardized beta coefficient of 0.445. The p-value for the t-statistic is less than 0.05 and therefore organizing laboratory facilities is a statistically significant predictor of students' achievement in physics practical test. In respect to this, the second research hypothesis stating that the organization of laboratory facilities has no statistically significant influence on students' achievement in physics was rejected. It therefore implied that organizing laboratory facilities was statistically significant predictor of students' achievement in physics practical test. This led to the following simple linear regression equation;

Students' achievement in physics practical test = 1.205 + 0.445 (Organizing laboratory facilities) + 0.26039

This implied that a unit increase in organization of laboratory facilities resulted into 0.445 units increase in student's achievement in physics in public secondary schools in Njoro Sub-county with other factors held constant. The results agree with Aderomu and Obafemi (2015) who found out that where there are adequately furnished laboratories and the teachers are not available to teach, effective learning cannot take place. Abdulkadir and Ma'aji (2014) agreed that personnel must be fully trained in all the tasks they are authorized to carry out. Training must be supported by up-to-date training records, which must also identify training needs. According to WHO (2005), careful adherence to these programmes will allow staff to take on a wider range of activities in the laboratory, and enable promotion, when opportunities arise. All staff in the laboratory will impact on the quality of the data generated, and must therefore have clear and agreed job descriptions. These must cover all the accountabilities that the job holder takes on, together with a clear description of the purpose of each one.

4.6 Influence of Coordination of Laboratory Facilities on Students Achievement in Physics Practical's

The third objective of the study sought to find out the influence of coordination of laboratory facilities on students achievement in physics practicals. According to Uko and Ayuk (2015), coordination is concerned with synchronizing and unifying the actions of a group of people. Coordination of laboratory facilities was measured using data generated by a set of 6 items in the physics teachers' laboratory management questionnaire. The physics teachers used the items to rate on a 1 to 5 scale their performance of coordination of laboratory facilities functions. The mean of each the items was computed and then transformed into coordination of laboratory facilities composite score (overall mean). The item means, standard deviations and the composite score are in Table 23.

Table 23:

Coordination of Laboratory Facilities

Coordination	Mean	SD
Scheduling experimental activities in class such that they do not clash	4.09	0.87
Synchronizing practical to theory that has been covered in class	3.19	0.92
Overseeing issuance of equipment to students at the beginning of practical sessions	3.96	0.86
Ensuring practicals of all groups in a class yield similar learning outcomes	2.79	0.88
Ensuring all equipment are collected at the end of practical sessions	3.43	0.95
Storing all equipment after the practicals	2.96	0.95
Composite Score	**3.40**	**0.38**

The results in Table 20 result show that "Scheduling experimental activities in class such that they do not clash" had the highest mean (M = 4.09, SD = 0.87) while the mean (M = 2.79, SD = 0.88) of "Ensuring practicals of all groups in a class yield similar learning outcomes" was the lowest. The high mean is an indication that the physics teachers performed the coordination functions well while low item mean implies that a function was done unsatisfactorily. Functions such as “Overseeing issuance of equipment to students at the beginning of practical sessions” (M = 3.96, 0.6) was done satisfactorily while “Storing all equipment after the practicals” (M = 2.96, SD 0.95 wa not. Generally, coordination of laboratory facilities as measured by the index (M = 3.40, SD = 0.38) was fair given that it was out of 5. Generally teachers performed their coordination management function fairly.

The results are in agreement with (Adeyemo 2012) on the success of the students in physics depends on proper interaction between the teacher, the student and the laboratory facilities provided (Olufunke 2012). The use of appropriate teaching equipment and teaching method is critical to the successful teaching and learning of Physics. Further using small group cooperative teaching method facilitated students’ learning in Physics. This method increased students’ motivation to learn, also below average students’ were found to improve on their achievements than in regular teaching method class.

The influence of coordination of laboratory facilities on students’ performance in physics practicals was determined using simple linear regression. Whereas Pearson’s Correlation is excellent for showing association between two variables, simple Linear regression makes it ability to show the strength and direction of an association a step further by allowing a researcher to use the pattern of previously collected data to build a predictive model (Field, 2017). The link between the two variables was established by regressing coordination of laboratory facilities index on students practical physics test scores. The model summary is as shown in Table 24.

Table 24:

Regression of Teachers’ Co0rdination for Laboratory Facilities in Students’ Achievement

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.720[a]	0.518	0.516	0.22729

a. Predictors: (Constant), Coordination of Laboratory Facilities

Table 24 depicts that R value is 0.720, R Square value is 0.518, adjusted R-Square value is 0.516 and standard error of estimate is 0.22729. It implies there was a strong correlation between the observed values and the predicted values of the students’ performance in the physics practical test. R Square value of 0.518 implies that 51.8% of the variation in students’ achievement in physics practical test is due to the variation in coordination of laboratory facilities. A low standard error of estimate of 0.22729 shows that the regression model is accurate in predicting the students' achievement in physics practical test using the coordination of laboratory facilities as the predictor variable. Table 25 shows the ANOVA for coordination of laboratory facilities model that test the overall significance of the model.

Table 25:

ANOVA for Coordination of Laboratory Facilities Model

	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	18.030	1	18.030	349.027	0.000
	Residual	16.789	291	0.052		
	Total	34.819	292			

a. Dependent Variable: Students' Achievement in Physics Practical Test

b. Predictors: (Constant), Coordination of Laboratory Facilities

As depicted in Table 25, the results of F-test are that F(1,291)=349.027with a p-value less than 0.05. This implies that the regression model has statistically significant capacity to predict the students' achievement in physics practical test. Table 26 shows the influence of coordination of laboratory facilities on students' achievement in physics practical test.

Table 26:

Regression Coefficient for Coordinating Laboratory Facilities

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	**Std. Error**	**Beta**	**t**	**Sig.**
1	(Constant)	1.074	0.061		17.586	0.000
	Coordinating Laboratory Facilities	0.473	0.025	0.720	18.682	0.000

a. Dependent Variable: Students' Achievement in Physics Practical Test

Results in Table 26 implies that for every one unit increase in coordination of laboratory facilities, students' achievement in physics practical test increases by 0.473units with other factors held constant. This is shown by unstandardized beta coefficient of 0.473. The p-value for the t-statistic is less than 0.05 and therefore coordination of laboratory facilities statistically and significantly influences students' achievement in physics practical test. The third research hypothesis stating that the coordination of laboratory facilities has no statistically significant influence on students' achievement in physics was therefore rejected. In respect to this, the following equation was arrived at;

Students' achievement in physics practical test = 1.074 + 0.473 (Coordination of laboratory facilities) +0.22729

This implied that a unit increase in coordination of laboratory facilities resulted into 0.473 units increase in student's achievement in physics in public secondary schools in Njoro Sub-county with other factors held constant. The study findings are in line with findings by Amuka, Olel, Frederick and Gravenir (2010) who found out that coordination of class experiments without clashing through systematic provision of the equipment to students for class experiments, collection and storage of the equipment after the practical boost student performance in practical work in science subjects.

4.7Influence of Leadership in the Laboratory on Students Achievement in Physics Practical

Objective four of the study examined the influence of leadership in the laboratory on student's achievement in physics practical. Leadership is crucial because it enables school managers to organize the teaching and learning process and ensure that the mission of the school is achieved (Lydiah & Nasongo, 2009). Data on leadership in the laboratory was gathered using physics teacher's laboratory management questionnaire. The items that were used to measure leadership were close ended and of the Likert type. The participants' responses to the items were assigned scores, averaged and transformed into composite scores (Table 27).

Table 27:

Leadership in the Laboratory

Leadership	**n**	**Mean**	**SD**
Conveying the objectives of experiments to learners at beginning of laboratory sessions	47	4.06	0.73
Demonstrating how to operate laboratory equipment	47	3.91	0.75
Taking students through the steps to follow during experiments	48	3.88	0.70
Instilling confidence in learners during experiments	48	2.92	0.85
Motivating students to conduct experiments	48	3.08	0.92
Maintaining order in the laboratory during practicals	45	3.69	0.97
Lobby school administration to support laboratories through provision and maintenance of facilities	48	2.85	1.03
Composite Scores	**48**	**3.43**	**0.42**

The results in the Table 27 show that the means of the items ranged between 2.85(SD = 1.03) to 4.06 (SD = 0.73). An examination of the results in the table shows that 4 items had relatively high means. They are; Conveying the objectives of experiments to learners at beginning of laboratory sessions (4.06, SD = 0.73); Demonstrating how to operate laboratory equipment (M = 3.91, SD = 0.75); Taking students through the steps to follow during experiments (M = 3.88, SD = 0.70) and Maintaining order in the laboratory during practicals (M = 3.69, SD = 0.97). The high means is an indication that the physics teachers performed these leadership functions well. They results also show that means of some of the items were relatively low. For instances; Lobby school administration to support laboratories through provision and maintenance of facilities (M = 2.85, SD = 1.03); Instilling confidence in learners during experiments (M = 2.92, SD = 0.85) and Motivating students to conduct experiments (M = 3.08, SD = 0.92).

The low items means suggests that the teachers were not performing these functions well. The results in Table 24 further show that the leadership in the laboratory index was 3.43 (SD = 0.42). On the basis of the index, the physics teachers' leadership in the laboratory was rated fair given that the index was out of 5. McGuffin (2011) observed that principals lead schools, which perform well, and subject teachers who have the ability to set pace, lead and motivate staff and students to perform to their highest potential. Schools require good leaders to organize the process of teaching and learning to ensure that the mission of the school is achieved (Lydiah & Nasongo, 2009). Thakur (2014) posit that leadership is a major determining factor of the quality of education and school performance. Recent policy discussions in the USA and elsewhere suggest there is broad support for expanding teachers' participation in leadership and decision-making tasks besides the principals (Thakur, 2014).

The influence of leadership in the laboratory on students' academic achievement in physics practicals was determined using simple linear regression. Responses to items that were used to measure leadership in laboratories were averaged and transformed into composite scores. The composite scores were then regressed on student's physics practical test mean scores whose summary is given in Table 28.

Table 28:

Regression of Teachers' Leadership in Laboratory Facilities in Students' Achievement in Physics Practical Test

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.822[a]	0.676	0.674	0.27913

a. Predictors: (Constant), Leadership in the Laboratory

The findings in Table 28 shows that R-value for the regression model is 0.822, R Square value is 0.676, adjusted R-Square value is 0.674 and standard error of estimate is 0.27913. It implies there was a strong correlation between the observed values and the predicted values of the students' performance in the physics practical test. R Square value of 0.676 implies that leadership in the laboratory contributes 67.6% of the variation in students' achievement in physics practical test.A low standard error of estimate of 0.27913 implies that the regression model is accurate in its prediction of dependent variable. Table 29 shows the analysis of variance for the regression model to test its significance in the prediction.

Table 29:

ANOVA for Leadership in the Laboratory Model

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	9.497	1	9.497	121.885	0.000
	Residual	25.323	291	0.078		
	Total	34.819	293			

a. Dependent Variable: Students' Achievement in Physics Practical Test

b. Predictors: (Constant), Leadership in the Laboratory

According to study findings in Table 29, the results of F-test are that F(1,291)=121.885with a p-value less than 0.05. This implies that the regression model has statistically significant capacity to predict the students' achievement in physics practical test using leadership in the laboratory as the predictor variable. Table 30 shows the influence of leadership in the laboratory on students' achievement in physics practical test.

Table 30:

Regression Coefficient for Leadership in the Laboratory

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	1.379	0.075		18.335	0.000
	Leadership in the Laboratory	0.406	0.037	0.822	11.040	0.000

a. Dependent Variable: Students' Achievement in Physics Practical Test

Results in Table 30 indicates that for every one unit increase in leadership in the laboratory, students' achievement in physics practical test increases by 0.406 units with other factors held constant. This is supported by unstandardized beta coefficient of 0.473. The p-value for the t-statistic is less than 0.05 and therefore leadership in the laboratory statistically and significantly influences students' achievement in physics practical test. This study rejects the fourth hypothesis that stating that leadership in the laboratory has no statistically significant influence on students' achievement in physics. It therefore implied that leadership in the laboratory had statistically significant influence on students' achievement in physics. The following regression equation is therefore obtained;

Students' achievement in physics practical test = 1.379 + 0.406 (Leadership in the Laboratory) + 0.27913

This implied that a unit increase in leadership in the laboratory facilities resulted into 0.406 units increase in student's achievement in physics in public secondary schools in Njoro Sub-county with other factors held constant. The results support the findings of York, Gibson and Rankin(2015) that showed that teachers play a critical role in leading effective laboratory experiences. By carefully introducing the experiences in ways that are aligned with the learning goals of the science course and leading discussions and answering questions, the teacher can support students in linking their laboratory experiences to underlying science concepts. Selection of laboratory experiences that are clearly related to the ongoing flow of classroom, science instruction, the teacher can integrate student learning of both the processes of science and important science content Levin, Wasanga and Somerset (2011) reported that the academic achievement of students at secondary school level is not only a pointer of the effectiveness of schools but also a major determinant of the well-being of youths in particular and the nation in general. Bello (2011) reported that effective teachers are knowledgeable in their subjects, caring towards their students, fair and respectful to students, have positive attitudes towards teaching as profession are responsible in class and are motivating to the learners. Kapting'ei and Rutto (2014) argued that key overriding factors for the success of students' academic achievement is the teacher.

4.8 Influence of control of Laboratory Facilities on Students Achievement in Physics Practical

The last (fifth) objective of the study sought to establish the influence of control of laboratory facilities on students' achievement in physics practical. Dimov and Iliev (2010) defines control as laying standards, comparing actuals and correcting deviation-achieve objectives according to plans. Control of laboratory facilities was measured using a set of nine items in the physics teacher's laboratory management questionnaire. The responses to the items in were assigned scores that were averaged and then transformed into the control of laboratory facilities composite scores (Table 31).

Table 31:

Control of Laboratory Facilities

Control	**Mean**	**SD**
Safety induction of students	3.28	0.80
Ensuring that first aid kits are available in the laboratory	3.45	0.72
Ensuring firefighting facilities (extinguishers, blankets, exits) are available	3.04	0.81
Provision of Protective gears (laboratory coats, gloves, goggles) to students	2.57	0.77
Overseeing maintenance of the physics laboratory facilities	2.94	0.84
Computerising laboratory records	2.32	0.93
Ensuring compliance with health and safety regulations (laboratory well light, ventilated, doors easy to open, windows have no grills)	3.28	0.88
Handling of dangerous-hazardous goods	3.81	0.82
Correcting health/safety regulations violations	2.89	0.91
Composite Scores	**3.06**	**0.40**

The results contained in Table 31 show that the means of the ranged between 2.32 (SD = 0.93) and 3.81 (SD = 0.82). The relatively low items means is an indication that the physics teachers were not performing those control functions well. There is however one exception, the item mean score on Handling of dangerous-hazardous goods was reasonable high (M = 3.81, SD = 0.82). The means that the teachers effectively facilitate safe handling of dangerous-hazardous goods in the laboratories. Despite effectively facilitation of safe handling of dangerous-hazardous goods in the laboratories, control of laboratory facilities was rated fair on the basis of the index (M = 3.06, SD = 0.40) which was out of 5. The study supports the results from Lawanson *et al.* (2011) that laboratory needs to provide a safe environment for scientists to complete their research and provide answers to questions resulting in new developments for the global community.

The influence of the control of laboratory facilities on students' achievement in physics practical was established using simple linear regression. The influence was determined by regressing control of laboratory facilities index on the students practical physics mean. Table

32 gives the summary for the linear regression model between control of laboratory facilities and students achievement in physics practical.

Table 32:

Regression of Teachers' Control for Laboratory Facilities in Students' Achievement in Physics Practical Test

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.622[a]	0.387	0.385	0.32057

a. Predictors: (Constant), Control of Laboratory Facilities

The study findings a shown in Table 32 depicts an R value of 0.622, R Square value of 0.387, adjusted R-Square value of 0.385 and standard error of estimate of 0.32057. An R-value of 0.622 implies there was an average correlation between the observed values and the predicted values of the students' performance in physics practical test. R Square value of 0.387 implies that 38.7% of the variation in students' achievement in physics practical test is attributable to control of laboratory facilities. A low standard error of estimate of 0.32057 implies that the regression model is accurate in its prediction of dependent variable. Table 33 presents the findings on the analysis of variance for the regression model in order to establish the significance of the model in predicting students' achievement in physics practical test attributable to control of laboratory facilities.

Table 33:

ANOVA for Control of Laboratory Facilities

Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	1.420	1	1.420	13.821	0.062
	Residual	33.399	291	0.103		
	Total	34.819	292			

a. Dependent Variable: Students' Achievement in Physics Practical Test

b. Predictors: (Constant), Control of Laboratory Facilities

From the analysis of variance, it was found that $F(1,291)=13.821$ with a p-value greater than 0.05. This implies that the regression model has no statistically significant capacity to predict the students' achievement in physics practical test using control of laboratory facilities as the predictor variable. Table 34 shows the influence of control of laboratory facilities on students' achievement in physics practical test.

Table 34:

Regression Coefficient for Control of Laboratory Facilities

Model		**Unstandardized Coefficients**		**Standardized Coefficients**		
		B	**Std. Error**	**Beta**	**t**	**Sig.**
1	(Constant)	1.849	0.094		19.700	0.078
	Control of Laboratory Facilities	0.174	0.047	0.622	3.718	0.062

a. Dependent Variable: Students' Achievement in Physics Practical Test

The study results in Table 34 indicates that for every one unit increase in control of laboratory facilities, students' achievement in physics practical test increases by 0.174 units with other factors held constant. This is supported by unstandardized beta coefficient of 0.174. This influence was however not statistically and significantly due to p-value for the t-statistic greater than 0.05 and therefore control of laboratory facilities do influence students' achievement in physics practical test. This study fails to reject the fifth hypothesis that stating that control of laboratory facilities has no statistically significant influence on students' achievement in physics. Control of laboratory facilities was positively related to students' academic performance in the physics practical test. However, the predictor variable did not explain a significant variation in the mean of the outcome. Therefore it implied that control of laboratory facilities had no statistically significant influence on students' achievement in physics. The study differs with the findings by Ifeoma (2012) found that if school facilities are not well managed and maintained, they constitute health hazards to pupils and teachers who use the facilities. Schools that plan and maintain their facilities had higher students' retention and is more effective than the others. The findings have no relationship on maintenance or control of laboratory facilities and the student's achievement.

4.9 Multiple Regression Analysis

The study further sought to establish the influence of planning for laboratory facilities, organizing laboratory facilities, coordination of laboratory facilities, leadership in the laboratory and control of laboratory facilities on students' achievement in physics practical test cumulatively. This was done by use of multiple linear regression. Multiple linear regression shows how various independent variables predicts the dependent variable (Field, 2017). Table 35 shows the model summary for the multiple linear regression.

Table 35:

Regression of Teachers' Management of Laboratory Facilities in Students' Achievement in Physics Practical Test

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.884[a]	0.781	0.775	0.12372

a. Predictors: (Constant), Planning, Organizing, Coordination, Leadership, Control

Based on the model summary, there was a strong correlation between the observed values of the dependent variable and predicted values of dependent variable (Salkind, 2009). This is due to an R- Value of 0.884 which indicates that there was a close relationship between the values of students' achievement in physics practical test observed through the issued questionnaires and the values of students' achievement in physics practical test predicted using the multiple linear regression model. This implies that the regression model presents a good fit for the data (Mugenda & Mugenda, 2003). An R-Square value of 0.781 was obtained by squaring the R-value and it indicates that 78.1% of the changes in the level of students' achievement in physics practical test in in public secondary schools in Njoro Sub County is explained by changes in planning for laboratory facilities, organizing laboratory facilities, coordination of laboratory facilities, leadership in the laboratory and control of laboratory facilities on students' achievement in physics practical test cumulatively.

An Adjusted R-Square value of 0.775, which is lower than the R-Square value of 0.781 indicates that any additional predictor variable to the regression model would result into less improvement in the regression model than expected. A low value of standard error of estimate of 0.12372 indicates that the regression model is accurate in its prediction (Cronck, 2014). The study further sought to establish whether the regression model as a whole is statistically significant using analysis of variance as shown in Table 36.

Table 36:

ANOVA[a] for the Multiple Regression

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6.107	5	12.036	152.993	0.000[b]
	Residual	1.714	287	0.015		
	Total	7.822	292			

a. Dependent Variable: Students' Achievement in Physics Practical Test

b. Predictors: (Constant), Planning, Organizing, Coordination, Leadership, Control

From Table 36, the study further established that F(3,287)=152.993and p<0.05. This implied that the regression model was statistically significant in predicting the level of students' achievement in physics practical test in in public secondary schools in Njoro Sub County. This showed that the regression model provides a better prediction than a model that contains zero predictor variables (Kearney, 2016).Despite focusing on the significance of the model as a whole, the study further sought to establish the significant of individual predictors in the regression model as shown in Table 37.

Table 37:

Coefficients[a] for the Multiple Regression

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.176	0.198		0.893	0.374
	Planning for Laboratory Facilities	0.254	0.027	0.820	9.396	0.000
	Organizing Laboratory Facilities	0.239	0.030	0.763	8.070	0.000
	Coordination of Laboratory Facilities	0.251	0.029	0.793	8.799	0.000
	Leadership in the Laboratory	0.264	0.026	0.869	10.194	0.000
	Control of Laboratory Facilities	0.213	0.133	0.657	1.685	0.087

a. Dependent Variable: Students' Achievement in Physics Practical Test

The unstandardized beta coefficients indicates the level of contribution of each of the independent variable on the dependent variables when other factors are held constant. The standardized beta coefficients shows the sensitivity of the regression model when all variances were equated to one (Miller& Whicker, 2017).T-statistics on the other hand indicates the significance of the regression model with its associated p-values (Kultar, 2014). Based on the regression findings, the following regression equation was formulated;

$Y = 0.176 + 0.251 X_1 + 0.239 X_2 + 0.251 X_3 + 0.264X_4 + 0.12372$

Where:

Y = Students' Achievement in Physics Practical Test

X1 = Planning for Laboratory Facilities

X2 = Organizing Laboratory Facilities

X3 = Coordination of Laboratory Facilities

X4 = Leadership in the Laboratory

The results indicates that one unit increase in planning for laboratory facilities would lead to an increase in students' achievement in physics practical test by 0.254 units provided other factors are held constant. This is because of unstandardized beta coefficient of 0.254. One unit increase in organizing laboratory facilities would lead to 0.239 units increase in students' achievement in physics practical test when other factors are held constant. This was due to unstandardized beta coefficient of 0.239. Focusing on coordination of laboratory facilities, the study established that one unit increase in the level of coordination of laboratory facilities when other factors are held constant would result into increase in the level of students' achievement in physics practical test by 0.251. This was due to unstandardized beta coefficient of 0.251.

Unstandardized beta coefficient of 0.264 was obtained in regard to leadership in the laboratory. This implied that one unit increase in leadership in the laboratory would lead to 0.264 units increase in students' achievement in physics practical test when other factors are held constant. Lastly, unstandardized beta coefficient of 0.213 was obtained in regard to control of laboratory facilities. This implied that one unit increase in control of laboratory facilities would lead to 0.213 units increase in students' achievement in physics practical test when other factors are held constant. This implied that leadership in the laboratory had the greatest impact on students' achievement in physics practical test, followed by planning for laboratory facilities, then coordination of laboratory facilities, organizing laboratory facilities and lastly control of laboratory facilities.

Focusing on t-statistic and the associated p-values in the regression coefficients, it was observed that all the t-statistic values except for control of laboratory facilities were greater than the critical value. Similarly, all the p-values were less than 0.05except for control of laboratory facilities ($p>0.05$). This implied that planning for laboratory facilities, organizing laboratory facilities, coordination of laboratory facilities and leadership in the laboratory statistically influenced the level of students' achievement in physics practical test in public secondary schools in Njoro Sub County. The control of laboratory facilities did not statistically influence the level of students' achievement in physics practical test in public secondary schools in Njoro Sub County and therefore excluded in the regression model.

CHAPTER FIVE
SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents a summary of the findings of the study, conclusions, and their implications on student's achievement in Physics at secondary school level. It also presents the recommendations and makes suggestions for further research.

5.2 Summary of Findings of the Study

Five hypotheses were tested using the simple regression procedure and the results revealed that:

i) There was a positive relationship between planning for laboratory facilities and students achievement in physics practical. The planning for laboratory facilities accounted for a significant variation percentage in physics practical test mean.
ii) The relationship between organization of laboratory facilities and students achievement in physics practical was positive and the predictor variable accounted for a significant variation percentage in physics practical test mean
iii) Coordination of laboratory facilities positively related to students' academic performance in physics practical. Further coordination of laboratory facilities accounted for a significant variation percentage in the physics practical test mean.
iv) The relationship between leadership in the laboratory and students achievement in physics practical was positive and. the results further showed that leadership in the laboratory explained a significant variation percentage in the mean of the outcome.
v) Control of laboratory facilities was positively related to students' academic performance in the physics practical test. However the predictor variable did not explain a significant variation percentage in the mean of the outcome

5.3 Conclusions of the Study

The results revealed that planning for laboratory facilities, organization of laboratory facilities, coordination of laboratory facilities and leadership in laboratories were significantly related to students' performance in physics practical while control of laboratory facilities was not. Based on these results, it was found out that there was a relationship between:

i. Planning for laboratory facilities and student's achievement in physics practical;

ii. Organization of laboratory facilities and students’ achievement in physics practical;
iii. Coordination of laboratory facilities and students’ achievement in physics practical;
iv. Leadership in laboratory and students’ achievement in physics practical.
v. It was however found out that there was no relationship between control of laboratory facilities and student’s’ achievement in physics practical.

5.4 Implications of the Study

The results of this study revealed that planning for laboratory facilities, organization of laboratory facilities, coordination of laboratory facilities and leadership in laboratories all significantly related to student’s performance in physics practical while control of laboratory facilities was not. These findings have significant implications in the teaching, learning and performance in physics given that they show the aspects of management that affect academic performance in the subject. It implies that student’s performance in physics practical and the subject in general can be enhanced by ensuring that teachers have laboratory management skills. This can be accomplished through in-service programmes, workshops, seminars and conferences. Efforts to improve the management of laboratory facilities must also be accompanied by improvements in other factors that enhance performance in physics such as adequacy of laboratory facilities, motivation, teaching methods, a conducive environment at both school and home.

5.5 Recommendations

In light of the findings and conclusions of the study, the following recommendations were made:

i) The results established that a reasonable percentage of the schools that participated in the study did not have laboratories. It is recommended that school administrators, parents, county and national governments and other education stakeholders should mobilize funds to enable such schools construct laboratories.
ii) It was observed that some of the basic laboratory apparatus and equipment were not available while the condition of some of the facilities, equipment and apparatus were not good. It is recommended that schools should mobilize funds for purchasing new equipment and prepare maintenance schedules. Implementing such strategies will not only boost availability of facilities but also their serviceability
iii) Teachers should adopt laboratory management practices given that it enhances academic performance in physics practicals.

iv) The mean scores of the physics teachers' management skills were just averagely rated. In order to enhance management of laboratory facilities, school administrators should organize for the training of physics teachers.

5.6 Suggestions for Further Research

This study has provided a valuable insight on the influence of management of laboratory facilities on achievement in physics. The following areas require further investigation.

i) The study only involved public secondary schools, it would be interesting to conduct a similar study using a larger sample drawn from other sub counties and private schools. It is believed that such a study would improve the generalizability of the results.

ii) The study focused on managerial skills of laboratory facilities by physics teachers and its influence on the academic achievement of students in physics practical tests and therefore a further study can done on the managerial skills of laboratory facilities by laboratory technicians and how this affects the academic achievement of students in physics practical tests in order to establish whether the results are comparable.

iii) This study focused on physics teachers and management of laboratories facilities. According to Lunenber (2010), one of the key responsibility of school administrators is facilities management. Studies should be conducted that involves school administrators such as the principals and the heads of department given the central role they play in school management.

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APPENDICES

APPENDIX A: STUDENTS' PHYSICS PRACTICAL ACHIEVEMENT TEST (SPPAT)

Admission No__________________ Class _____________Date___________________

SECTION A: BIO-DATA

School..

Gender Female ( ) Male ( )

Division ....

INSTRUCTIONS

Answer all the questions below

Read and record your correct observations as soon as they are made

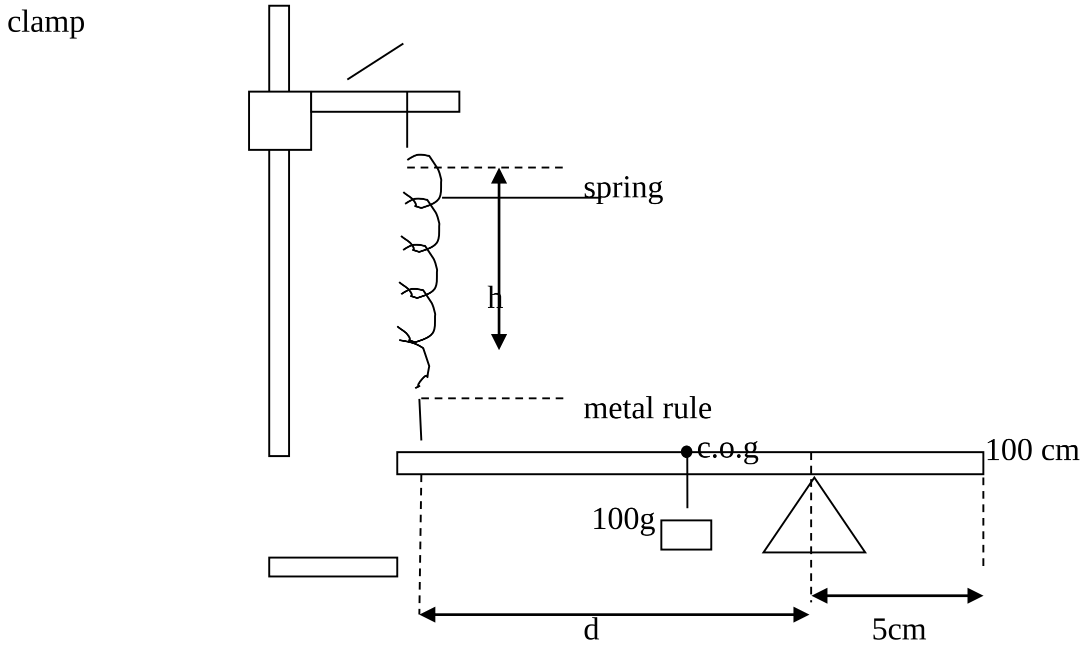
SECTION B: QUESTIONS

1.You are provided with the following: spiral spring, A complete stand, A meter rule, A 100g mass, A knife edge (raised on a wooden block),A half meter rule, Vernier calliper's and micrometer screw gauge.

Proceed as follows:

(a) Determine the centre of gravity of the metre rule using the knife edge c.o.g. = ……….cm (1 mark)

(b) Set up the apparatus as shown. Using a string, hang the 100g mass on the c.o.g of the metre rule determined in (a) above.



i. Adjust the position of the pivot so that it is approximately 5cm from the free end of the metre rule.

ii. Adjust the clamp so that the metre rule is horizontal and the spring is vertical at the 2cm mark.

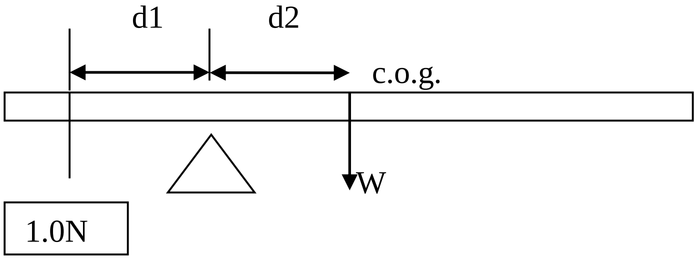
iii. Measure and record the length *h* of the coiled part of the spring and distance *d* from the pivot to the point where the springs is attached to the metre rule.

iv. Repeat (c) and (d) for different positions of the pivot along the metre rule as shown in the table below.

Position of pivot from free end	5	15	25	35	45	
Length h (cm)						
d(cm)						

1mrk each

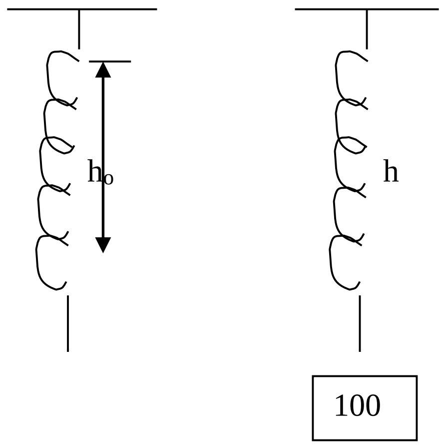
2. Adjust the position of the pivot so that it is at 20 cm mark of the metre rule. Using a mass of 100g balance the metre rule and determine d_1 and d_2



d_1 = …………………………………………… (1 mark)

d_2 = ……………………………………………… (1 mark)

Arrange the spring balance as shown below using the 100g mass and determine h_o and h (1 marks)



h_o = ……………………………………………(1 mark)

h = ………………………………………… (1 mark)

Extension of the spring………………………………………….(1mrks)

((b). Use the Vernier callipers and measure the internal diameter of the spiral spring in ………………………..cm (1mark) and in ……………………..m. (1 mark)

(c). Using the micrometer screw gauge provided, measure the diameter, of the wire making up the spiral spring. D= ___________mm (1mrks)……………………..(M)(1mrk)

TOTAL SCORE MARKS………………………………..

APPENDIX B: MARKING SCHEME FOR THE SPPAT

Q1

a) 50.0cm (2mrk)

b)

Position of pivot from free end	5	15	25	35	45	
Length h (cm)	13.0	11.5	10.0	8.5	6.5	
d(cm)	93.0	83.0	73.0	63.0	53.0	

(10marks)

Q2

d1 = 23cm (1mrk)

d2 = 20cm (1mrk)

Q3. h= 5cm (1 mark)

h_1 = 12.5cm (1mark)

h_1 - h

b) Internal diameter = 2.3cm (2mrks)

c) Diameter of the wire =0.32mm (2mrks)

APPENDIX C: PHYSICS TEACHER LABORATORY FACILITIES MANAGEMENT QUESTIONNAIRE (PTLFMQ)

SCHOOL CODE: ____________________________ DIVISION________________

DATE______________

The statements below are on Management of Physics Laboratory Facilities in Njoro sub county public secondary schools. Rate the statements based on a rating scale of 1 to 5 for: Very Poor=1, Poor=2, Fair =3, Good =4, Very Good =5. Put a (√) on the most appropriate choice. The information you give will be treated with utmost confidentiality.

Checkpoints	**VP**	**P**	**F**	**G**	**VG**
Planning					
Availability of the physics equipment					
Quality of the physics equipment?					
Quantity of physics equipment.					
Storage –How is the storage of the physics equipment when not in use?					
Storage space-How is the storage space for the equipment?					
Ventilation of the laboratory-How ventilated is the laboratory. Is it comfortable for working?					
Lightning- How is the laboratory lighting in conducting class experiments?					
Furniture - How sufficient is it for students' practicals?					
What is the condition of the floor?					
Laboratory – Does the school has a physics laboratory?	Yes		No		
Organization					
Staffing of laboratory technicians-How sufficient are they? For the work in the laboratory?					
Staffing of physics teachers-How sufficient are they to handle the students' class experiments?					
How clearly are the roles defined in the laboratory?					
To what extent have the physics teachers attended SMASSE?					

To what extend have the physics teachers attended Management? Courses- by KEMI?					
To what extend have the laboratory technicians attended in-service courses?					
Laboratory technicians qualifications-How qualified are they to handle students equipment?					
How is the retention of laboratory technicians in the school?					
Leadership					
What is the frequency of student's attendance of class experiments from the records filed?					
To what extend does the school administration support the purchase on the physics equipment?					
Coordination					
How effective has it been in grouping students in groups of three or less in doing class experiments					
How effective is the students grouping in doing the practicals					
Control					
What is the state of Fire Exits- Clear of obstruction and door opening outward mechanism look in good condition?					
What is the state of presence of personal protective equipment-lab coats worn?					
What is the state of maintenance of the physics laboratory facilities- How well maintained are they?					
What is the state of fire extinguishers in the laboratory? Do they have the green tag? Have they been replaced for the last 12 months					
What is the state of the First Aid kits in the laboratory? Is it functional and fully equipped?					
How is the computerizing of information and records in the laboratory?					

How is the replacement of breakages or losses of physics equipment in the laboratory- are there records?					
What is the safety of the students in the laboratory? Doors open outwards, windows have no grills and chimney is functional. Fire Blankets- present and tested within 12 months?					
What is the safety of the laboratory technicians in the laboratory? In terms of provision of insurance cover, lab coats and gloves to work in the laboratory.					
How is the safety induction in the laboratory to students? Are form ones inducted on their use?					

APPENDIX D: LABORATORY FACILITY OBSERVATION CHECKLIST

Rate the state of the mostly commonly used physics equipment in the laboratory by putting a tick (✓) on your most appropriate choice.

Commonly used Physics Equipment	**Very Good**	**Good**	**Poor**	**Very Poor**	**Not Available**
Voltmeters Ammeters Rheostats Millimetres Switches Connecting wires					
Lenses Glass Blocks Mirror Prisms Pins Lense holder					
Masses Springs Metre rules					
Magnets					
Charts and Photographs					
Calorimeters Burners/heaters Thermometers					
Vernier callipers Micrometer Screw gauge Clamp Stands Stopwatches					
Beam balance/Electronic balance					

Pinhole camera					
Spring balances					
Slinky spring					
Ripple tank					
Capacitors					

State of the infrastructure in the Laboratory

Infrastructure	Very Good	Good	Fair	poor	Very poor
Benches					
Stools					
Floor					
Windows					
Wall					
Roof					
Painting					
Lighting					
Electric switches					
Gas taps					
Water taps					

APPENDIX E: INTRODUCTION LETTER FROM EGERTON UNIBERSITY

EGERTON *UNIVERSITY*

Tel: Pilot: 254-51-2217620
254-51-2217877
254-51-2217631
Dir.line/Fax: 254-51-2217847
Cell Phone
Extension; 3606

P.O. Box 536 - 20115
Egerton, Njoro, Kenya
Email: bpgs@egerton.ac.ke
www.egerton.ac.ke

OFFICE OF THE DIRECTOR GRADUATE SCHOOL

Ref:...**EM15/2909/11**

Date: 9th March, 2017

The Director General
National Commission for Science Technology and Innovation
P. O. Box 30623-00100,
NAIROBI.

Dear Sir,

RE: REQUEST FOR RESEARCH PERMIT – ELIZABETH NTHENYA KITAVI REG. NO. EM15/2909/11

This is to introduce and confirm to you that the above named student is in the Department of Curriculum, Instruction & Education Management, Faculty of Education & Community Studies,Egerton University.

She is a bonafide registered Masters student in this University. Her research topic is entitled **"Influence of Management of Laboratory Facilities on Secondary School Student's Achievement in Physics in Njoro SubCounty, Kenya."**

She is at the stage of collecting field data. Please issue her with a research permit to enable her undertake the studies.

Yours faithfully,

9 MAR 2017

Prof. Nzula Kitaka
DIRECTOR, BOARD OF POSTGRADUATE STUDIES

NK/ear

"Transforming Lives Through Quality Education"

APPENDIX F: RESEARCH PERMIT FROM NACOSTI

NATIONAL COMMISSION FORSCIENCE, TECHNOLOGY ANDINNOVATION

Telephone:+254-20-2213471, 2241349,3310571,2219420
Fax: +254-20-318245,318249
Email: dg@nacosti.go.ke
Website: www.nacosti.go.ke
When replying please quote

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

Ref. No. **NACOSTI/P/17/74035/17483**

Date: **14th June, 2017**

Elizabeth Nthenya Kitavi
Egerton University
P.O. Box 536-20115
EGERTON.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on ***"Influence of management of laboratory facilities on secondary school students' achievement in physics in Njoro Sub County, Kenya,"*** I am pleased to inform you that you have been authorized to undertake research in **Nakuru County** for the period ending **13th June, 2018.**

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

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

GODFREY P. KALERWA MSc., MBA, MKIM
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner
Nakuru County.

The County Director of Education
Nakuru County.

APPENDIX G: RESEARCH AUTHORIZATION FROM THE COUNTY DIRECTOR OF EDUCATION

MINISTRY OF EDUCATION

State Department of Basic Education

Telegrams: "EDUCATION",
Telephone: 051-2216917
Fax: 051-2217308
Email: cdenakurucounty@yahoo.com
When replying please quote
Ref. NO.
CDE/NKU/GEN/4/1/21/VOL.V/93

COUNTY DIRECTOR OF EDUCATION
NAKURU COUNTY
P. O. BOX 259,
NAKURU.

3rd July, 2017

TO WHOM IT MAY CONCERN

RE: RESEARCH AUTHORIZATION – ELIZABETH NTHENYA KITAVI
PERMIT NO. NACOSTI/P/17/74035/17483

Reference is made to letter NACOSTI/P/17/74035/17483 dated 14th June, 2017.

Authority is hereby granted to the above named to carry out research on **"Influence of management of laboratory facilities on secondary school students' achievement in physics in Njoro Sub County in Kenya,"** for a period ending 13th June, 2018.

Kindly accord her the necessary assistance.

AKOKO OKAYO
FOR: COUNTY DIRECTOR OF EDUCATION
NAKURU COUNTY

Copy to:

Egerton University
P. O. Box 536-20115
EGERTON