INSTRUCTIONAL INFLUENCES ON THE IMPLEMENTATION OF PHYSICS CURRICULUM IN SECONDARY SCHOOLS, A CASE STUDY OF BUNGOMA COUNTY KENYA

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WAFULA EDWARD NYONGESA

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DECLARATION

Declaration by the Candidate

I declare to the best of my knowledge that this thesis is my original work, all the sources that I have used or quoted have been indicated and acknowledged by means of complete reference and that it has never been submitted to any University or any other institution for an award

Sign: ________________________________ Date: ___________________________

WAFULA EDWARD NYONGESA

EDU/D.PHIL.CM/1004/15

Declaration by the Supervisors

I declare that the work reported in this thesis was carried out by the candidate under my supervision as the University supervisor (s).

Sign: _________________________________ Date: __________________________

PROF. (MRS). ANNE SYOMWENE KISILU

Department of Curriculum Instruction and Educational Media

School of Education

MOI UNIVERSITY, ELDORET-KENYA

Sign: ________________________________Date: ___________________________

PROF. CHRIS WEKESA MUKWA

Department of Curriculum Instruction and Educational Media

School of Education

MOI UNIVERSITY, ELDORET-KENYA.

DEDICATION

This work is dedicated to my GOD who has made everything possible, my dear wife Mary, daughter Esther Blessings and sons; Joseph Wekesa, Joshua Ushindi and all my unborn generations. I appreciate you for your love, understanding, moral support and sacrificial patience during my long stay away from home during my studies. I pray that you all live to be great scholars. Not forgetting my Dad Jamin Wafula and Mum Pasilisa Tawai and all my siblings. God bless them all by rewarding them with abundant life to live and enjoy the fruit of this sweat.

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ABSTRACT

Implementation of the curriculum is a critical stage in the curriculum development cycle. Yet over the years 2011 to 2015 students' achievement in Physics at Kenya Certificate of Secondary Education (KCSE) has been low coupled with low students' enrollment. Ineffective curriculum implementation was identified by scholars to be one of the possible causes of the low achievement. However, little was known regarding the instructional influences on the implementation of Physics curriculum. The purpose of this study was to determine instructional influences on the implementation of the Physics curriculum in secondary schools in Bungoma County Kenya. This study sought to determine the influence of teaching methods, learners' motivation, teaching-learning materials, teaching-learning activities and scope and coverage of the syllabus on implementation of Physics curriculum. This study was guided by cognitive constructivism theory of learning and adopted pragmatism research paradigm, mixed method approach and triangulation design. This study targeted 224 teachers of Physics and 4140 Form three Physics students in 283 public secondary schools in Bungoma County. Stratified and simple random techniques were used to select 22 schools. The Head of Subject (HOS) were purposively sampled from each selected school. The sample size was 22 teachers and 393 students making a total of 415 respondents. Data was collected between September and October, 2017 using Teacher Questionnaire (TQ), Student Questionnaire (SQ), Lesson Observation Schedule (LOS) and Observation Checklists (OC). Data was presented using frequency tables, figures and photographs and analyzed using both descriptive and inferential statistics. Descriptive statistics used to analyze quantitative data include; percentages and means while the inferential statistics used include; Chi-square, Pearson Product-Moment correlation and Regression analysis. Qualitative data was analyzed thematically. Statistical Package for Social Sciences (SPSS) version 20 was used to compute the analysis at $\alpha = 0.05$ level of significance. Both quantitative and qualitative results showed that non-use of student-centered teaching methods, lack of learners' motivation, inadequate provision of teaching-learning materials, minimal learning activities in classrooms and failure to cover the syllabus on time influenced the implementation of Physics curriculum. The study concluded that for effective curriculum implementation, students-centered teaching methods should be used, learners' be motivated, provide adequate learning material, many learning activities arranged and the scope of the syllabus be covered in-depth and timely. The study recommended that the teachers of Physic should be in-service on learner-centered methods, teachers should focus more on arousing learner's motivation, schools should be furnished with adequate learning materials, teachers should practice activity-centered teaching and the syllabus for Physics should be revised. The study findings provide an opportunity for teachers to improve on their classroom practices. Further, the findings provide a guide to the government on enhancing the implementation of the curriculum of Physics for improved performance.

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ABBREVIATIONS AND ACRONYMS

AAPT**:**	American Association of Physics Teachers
ADB:	African Development Bank
AIDS:	Acquired Immune Deficiency Syndrome
ASEI:	Activity Student Experiment and Improvisation
ASSURE:	Analyze learners, State objectives, Select media & materials, Utilize media; require learner participation, Evaluate & Revise
CATs:	Continuous Assessment Tests
CEMASTEA:	Centre for Mathematics, Science and Technology Education in Africa
CIEM:	Curriculum Instruction and Education Media
CDF:	Constituency Development Fund
DEM:	Discovery Experiments Method
DVs:	Dependent Variables
EFA:	Education for All
EMIS**:**	Educational Management Information Systems
EVs:	Extraneous Variables
ESP:	Economic Stimulus Programme
GOK:	Government of Kenya
HOD:	Head of Department
HOS:	Head of Subject
HIV**:**	Human Immunodeficiency Virus
IBT:	Inquiry Based Teaching
ICARE:	Introduce Connect Apply Reflect Extend
ICT:	Information Communication and Technology
INSET:	IN-Service Training
IOP:	Institute of Physics
IVs:	Independent Variables
JICA:	Japanese International Cooperation Agency
KCPE:	Kenya Certificate of Primary Examination
KCSE:	Kenya Certificate of Secondary Examination
KERB:	Kenya Engineers Registration Board
KIE**:**	Kenya Institute of Education

KIPPRA:	Kenya Institute for Public Policy Research and Analysis
KNBS:	Kenya National Bureau of Statistics
KNEC:	Kenya National Examinations Council
Ksh:	Kenya Shillings
KUCCPS:	Kenya Universities and Colleges Central Placement Service
LOF:	Lesson Observation Forms
MDGs:	Millennium Development Goals
MLA:	Mastery Learning Approach
MOE:	Ministry of Education
MOEST:	Ministry Of Education, Science and Technology
MOHEST:	Ministry of Higher Education Science and Technology
MRTTT:	Ministry of Research Technical Training and Technology
NACICTIE:	National Centre for ICT Integration in Education
NACOSTI:	National Commission for Science, Technology and Innovation
NEPAD:	New Partnership for African Development
NERDC:	Nigeria Educational Research Development Council
NGO:	Non-Governmental Organization
OC:	Observation Checklist
OLPC:	One Laptop per Child
PAT:	Physics Achievement Test
PBL:	Project Based Learning
PDE:	Provincial Director of Education
PDSI:	Plan Do See and Improve
PPP:	Public Private Partnership
PS:	Permanent Secretary
PTA:	Parents Teachers Association
RTM:	Regular Teaching Method
SESEMAT:	Secondary Science and Mathematics
SEPU:	Science Equipment Production Unit
SCA:	Science Club Activities
SDGs:	Sustainable Development Goals
SMASEE:	Strengthening Mathematics and Science Education in Ethiopia
SPSS:	Statistical Package for Social Sciences

SQ:	Students Questionnaire
SSA:	Sub- Saharan Africa
SSP:	School Science Project
TQ:	Teacher Questionnaire
TSC:	Teachers Service Commission
TVET:	Technical Vocational Entrepreneurship Training
UK:	United Kingdom
UNEP**:**	United Nations Environmental Program
UNESCO:	United Nations Educational Scientific and Cultural Organization
UNICEF:	United Nations Children's Fund
UNDP:	United Nations Development Programme
USA:	United States of America
USAID:	United States Agency for International Development
WAEC:	West Africa Examinations Council
WASCE:	West African School Certificate Examinations
WWW:	World Wide Web

CHAPTER ONE

INTRODUCTION TO THE STUDY

1.0 Introduction

This chapter gives an overview and basis for the study. It provides the background, statement of the problem, purpose of the study, objectives of the study, research questions, hypotheses, justification of the study, significance of the study, scope of the study, assumptions and limitations of the study, theoretical and conceptual framework, definition of operational terms and chapter summary.

1.1 Background to the Study

In this era of globalization and technological revolution, education is considered as a first step for every activity. The world leaders meeting held in New York in September, 2015 set new goals for social and economic development that countries (Kenya included), should pursue in the next 15years (Sustainable Development Goals [SDGs], 2015). The Sustainable Development Goals are aimed at transforming our world by the year 2030 (SDGs, 2015). The leaders' summit identified 17 goals out of which five goals are related to this study and states as follow:

1. End poverty in all its' forms everywhere.
2. Ensure inclusive and equitable education; promote lifelong learning opportunities for all.
3. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
4. Make cities and human settlements inclusive, safe, resilient and sustainable.
5. Take urgent action to combat climate change and its' impact (SDGs, 2015).

The five outlined goals are related to this study: First, in line with SDGs, this study envisaged to end poverty in all its' forms through improved education standards. Education as a main factor that facilitates and fosters effective attainment of social, economic and national development, individuals will acquire knowledge, skills and competence making them to be more productive economically. Secondly, in order to promote lifelong learning opportunities for all, enhanced curriculum implementation will equip learners with knowledge, skills and attitudes that are geared towards pursuing science-related courses and careers (SDGs, 2015).

Thirdly, in order to build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation, this study intent to put into place contemporary and interactive systems, including adequately addressing technological advancement. Forth, the SDGs envisaged to making cities and human settlements inclusive, safe, resilient and sustainable. In line with this goal, this study intent to combat emerging issues related to HIV and AIDs, censer and other emerging diseases.

Fifth, in order to take urgent action to combat climate change and its' impact this study through effective implementation of the curriculum for Physics was meant to equip learners with abilities to understand their environment and acquire scientific knowledge, skills and competencies and attitudes relevant in environmental conservation.

The SDGs' main aim was to achieve three main objectives, namely end extreme poverty, fighting inequality and injustice, and fixing climate change by the year 2030 (SDGs, 2015). The new goals too over from the previous Millennium Development Goals that had been set up at the turn of the Century (Millennium Development Goals [MDGs], 2000). It was acknowledged by the SDGs summit in September, 2015 in

New York USA that; sadly, most African Countries had not met a number of the MDGs; education included.

Human development is one of the strategic objectives according to Kenya vision 2030 (Republic of Kenya, 2010) in the vision; Kenya endeavored to expand her development, industrially and infrastructure leading to urbanization. If the Kenyan government is to meet her goal of industrialization by the year 2030 then she must expand her Education in science and technology and improve efficacy in curriculum implementation in order to produce the required human resource. Although Physics is essential for industrialization, there has been a decline in academic achievement as well as low enrolments in the subject (Kenya National Examination Council [KNEC], 2015). The Kenya vision 2030 recognizes that social and economic development ultimately depends on the quality of education offered. People with quality basic education are more productive and more likely to play an active role in development. It is universally recognized that investment in human development through Education is an essential component of any development plan (The Common Wealth of Learning & Asian Development Bank, 2009). Within the education sector, it has been understood that quality and access are perhaps the two most critical issues.

An evaluation of the Kenyan education system by UNESCO (2010) found out that the secondary school curriculum objectives had not been fully achieved as envisaged in 2002 syllabus. The evaluation revealed that some subjects had difficult and broad content; some schools had inadequate instructional materials; and inadequate number of teachers. With regard to aspects that relate to innovation and application of technology, curriculum implementation was visibly deficient as the majority of its products did not exhibit those attributes after school.

In Kenya, Physics curriculum implementation challenges range from methodological issues, lack of personnel, political, economic and cultural factors (Okere, 2000). Other critical issues that affected implementation of the curriculum for Physics in Kenya include: the difficulty and abstractness of certain topics; mismatch between language of instruction and the commonly used language; shortage of appropriate books; pressure of examination-oriented curricular and lack of adequate and relevant Physics apparatus (Changeiywo, 2002). This affected delivery of Physics syllabus content and in turn led to negative attitudes among learners and hence poor performance in national examinations.

Provision of adequately trained teachers had been too often an impediment to providing quality Education in Kenya. According to Ayiro (2015) the Education sector in Kenya still grappled with a shortage of teachers estimated at 80,000 tutors. Glaring inconsistencies on the side of the government has been observed every time critical areas including: quality of Education, relevance of Education offered, provision of computers and other resources for teaching and learning process. Amadalo, Ochola and Memba (2012) noted that modern life challenges posed by diseases such as cancer, Ebola and HIV/AIDS require continuing research that requires development of high precision equipments employing Physics principles.

The government of Kenya has invested a lot of resources in the curriculum implementation process through free secondary Education and Strengthening Mathematics and Sciences in Secondary Education (SMASSE) project. Yet students' achievement and enrolment in Physics Kenya Certificate of Secondary Education (KCSE) remains alarmingly low at 39.0 and 26.6 percent respectively over the years

2011 to 2015. For Kenya to achieve vision 2030 and the global SDGs; students' enrolment and achievement in KCSE Physics is critical.

The concern of this study was that the performance in Physics was still low and the subject registered declining enrollment in KCSE compared to other science subjects (Chemistry & Biology). All this concerns pointed at instructional influences on the implementation of the curriculum of Physics in secondary schools in Kenya. Therefore this study investigated instructional influences on the implementation of the Physics curriculum in secondary schools in Bungoma County. Table 1.1 and Table 1.2 shows the overall candidature, enrollment in Physics and students' performance in KCSE Physics examinations nationally and in Bungoma County respectively.

Table 1.1: Students' enrollment and performance in KCSE Physics nationally from 2011 to 2015.

Year	Total KCSE Candidates	Physics KCSE Candidates	Average Percentage (%)	Standard Deviation
2011	411,783	120,071 (29.15)	36.64	36.72
2012	436,349	118,508 (27.15)	37.87	34.58
2013	446,696	119,819 (26.82)	40.10	38.07
2014	488,234	122,842 (25.16)	37.20	37.08
2015	522,870	129,828(24.83)	43.68	39.89
Average	**461,186**	**122,213(26.62)**	**39.09**	**37.26**

Note: Figures in parenthesis are respective percentage enrollment

Source: Kenya National Examinations Council KNEC (2015).

Table 1.2: Students' enrollment and Performance in KCSE Physics in Bungoma County from 2011 to 2015

Year	Total KCSE Candidates	Physics KCSE Candidates	Average Percentage (%)	Standard Deviation
2011	15,980	3145 (19.68)	34.80	35.73
2012	16,899	3567 (21.10)	35.11	36.01
2013	17, 603	3884 (22.06)	35.43	36.72
2014	18,999	4325 (22.76)	35.50	36.92
2015	21,644	4740(21.89)	41.06	39.14
Average	**18,225**	**3,932(21.49%)**	**36.38**	**36.90**

Note: Figures in parenthesis are respective percentage enrollment
Source: Kenya National Examinational Council KNEC (2015)

Table 1.1, shows that performance in Physics in Kenya nationally had been low, registering an average of 39.09% in KCSE examinations. The standard deviation recorded in 2011 was 36.72 compared to 39.89 in 2015, this reflect huge disparity between the high and low achievers. Physics recorded an improvement in 2015 as seen in Table 1.1. However, despite the improvement the average mean score of 43.68% was still low in absolute terms (Karanja, 2016).

The overall enrolment as seen from Table 1.1, had increased from 120,071 in 2011 to 129,828 in 2015. This could be attributed to free primary and secondary Education in order to reach out to the large number of students. However, enrollment rates in Physics do not match the overall candidature growth; instead it had declining from 39.15% to 24.83% between 2011 and 2015. Secondly, enrolment still remained a big issue in Physics curriculum implementation in Kenya.

The subject enrolled averagely 26.6% of the total candidature at KCSE as compared to other sciences; Chemistry and Biology which enrolled 97.74% and 89.51% respectively (KNEC, 2015).

Table 1.2, indicated that performance and enrollment in Physics in Bungoma County had been similarly low at 36.38% and 21.49% respectively. This poor performance and low enrollment more or less mirrored the national performance .This showed that the County is far from attaining an average mean score of 50% and enrollment in Physics against total KCSE candidature. The poor performance in Physics had been attributed to inappropriate teaching methods, low student motivation to learn Physics, poor distribution and utilization of Physics learning materials, minimal learning activities in classroom and failure to complete the syllabus among other factors (SMASSE, 1998).

This is a worrying trend since much effort had been put in by the stakeholders through a number of initiatives and programs. A typical example is the SMASSE programme that was a joint agreement between the government of Kenya and Japan through the support of the Japanese International Cooperation Agency (JICA). The programme was piloted in 1998 and implemented in 2002 and had made significant steps in advocating for learner-centered approaches in teaching of sciences and mathematics in secondary schools.

Teaching methods advocated for by various researchers and different scholars (eg., Njoroge, Changeiywo & Ndirangu, 2014; Uside, Barchok & Abure, 2013; Kapting'ei & Rutto, 2014; Muriithi, Odundo, Origa & Gatumu, 2013; and Changeiywo, Wambugu & Wachanga, 2010) as being capable to enhance implementation of the

Physics curriculum; improve learners' motivation and achievement in Physics in the 21st Century include:

Inquiry-Based Teaching (IBT), Project method, Laboratory practical, discovery experiment, Mastery Leaning Approach (MLA) and ICT integration .Therefore, pedagogical reforms are urgent in order for the country to achieve vision 2030 and SDGs by the year 2030.

Njoroge et al., (2014) in the study on Effect of IBT on students motivation and achievement in Nyeri County found out that learner-centered IBT method developed positives attitudes towards learning Physics; hence improvement in performance and increase in enrollment in the subject in Kenyan secondary school. Thus, there was need to address the prevailing status of Physics pedagogical challenges in secondary schools in Bungoma County and Kenya at large. This study determined the influence of teaching methods on the implementation of the Physics curriculum in secondary schools in Bungoma County.

The declining learner's motivation to study Physics and the lack of enthusiasm to take Physics in secondary school or avoiding Physics had been an international problem (Semela, 2010; Amunga, Amadalo & Musere, 2011; Andrews, 2006). The decline in enrollment and graduation rate in Physics at all levels had been the case in many countries including the USA, UK, Germany, and the Netherlands (Institute of Physics [IOP], 2012; Suleiman, 2013 & Thomas, 2012). Existing research literature showed that the erosion of interest in the subject found to emerge as early as lower high school and later resulted in compromising college enrolment (Aina, Olanipeku & Garubu, 2015; Semela, 2010 & Adeyemo, 2010).

In this regard, a number of factors identified to underpin the low motivation to study science in general and Physics in particular. Recognizing the far reaching challenges, attempts had been made by the Kenyan Education sector to improve students' motivation in Physics. These among others included introduction of SMASSE project which encouraged the use of learner-centered teaching strategies like; ICT integration and implementing teachers' in-service professional development by introducing "innovative" Physics curricula (SMASSE, 1998). Despite the fact that the SMASSE program had been on for about 18 years; low motivation to study Physics among students still persisted in Bungoma County as in the case nationally. This study determined the influences of learners' motivation on the implementation of the Physics curriculum in secondary schools in Bungoma County.According to UNICEF (2007) schools are not accessible unless they have adequate Educational materials. The agency recommended that appropriate measures need to be introduced to review the total equipment requirements.

Influence of instructional materials on implementation of curriculum had also been supported by Kapting'ei and Rutto (2014) in a study on challenges facing laboratory practical approach in Physics instruction in Kenyan secondary schools. Kapting'ei and Rutto (2014) observed that more than 70% of the schools had insufficient laboratory equipments, apparatus and chemicals. Despite the emphasis on practical approaches in Physics instruction as indicated in the syllabus KIE (2002); little had been achieved.

In the absence of adequate learning materials, teachers concentrated on imparting theoretical skills at the expense of practical skills and desired attitudes and values. Effective Instruction in Physics requires a practical approach. The curriculum revision of 2002 envisaged that learners would be equipped with competencies to operate effectively in a knowledge based economy (UNESCO, 2010). This study determined the influence of teaching-learning materials on the implementation of the Physics curriculum in secondary schools in Bungoma County.

Teaching-learning activities, through which students become active participants in the learning process are an important means for development of student skills (Orhan, 2009). In the process of active learning students move from being passive recipients of knowledge to being participants in activities that encompass analysis, synthesis and evaluation besides developing skills, values and attitudes. Sciences (Physics included) are practical subjects hence best learnt through experiments, observations, analysis and generalization of conclusions.

Kapting'ei and Rutto (2014) contended that rather than putting fully formed knowledge into the learners' minds, the teacher should guide them in constructing knowledge through scientifically valid approaches. Teaching-learning activities promote constructivist learning theories. These theories explain knowledge as being constructed through effective and purposeful hands-on materials instruction.

Some of the scientific learning activities employed in implementation of Physics curriculum include; performing experiments, making observations, recording results, discussing the results. However, with the limited learning materials due to the economic factors, most teachers of Physics overuse lecture, question-answer, problem-solving and demonstration methods in curriculum implementation. This study determined the influences of teaching-learning activities on the implementation of the Physics curriculum in secondary schools in Bungoma County.

Many factors play a role in motivating curriculum reforms some of these include: whether the curriculum objectives are clear, pertinent to the needs of society, achievable and realistic; whether the curriculum is overloaded; the scope and depth of the existing curriculum; areas of unnecessary overlap within and across subjects; availability, adequacy and appropriateness of the resources (physical and human) for effective curriculum implementation (UNESCO, 2010).

The evaluation of the Education process by UNESCO (2010) found out that Kenyan schools burden learners with frequent Continuous Assessment Tests (CATs) at the expense of learning due to the high stakes placed on summative examinations. Other consequences of this situation included private tutoring, extra-tuition, remedial teaching and use of commercially developed examination papers which at times do not conform to the curriculum or what the teacher had taught.

Further, KNEC the examining body in Kenya had developed a parallel syllabus to that of KICD and it appeared to be more attractive to teachers. Based on these facts, this study determined the influence of scope and coverage of the syllabus on the implementation of the Physics curriculum in secondary schools in Bungoma County.

1.2 Statement of the Problem

There has been perpetual low performance in KCSE Physics in Kenya for over a decade (KNEC, 2015). More devastating; Physics performance declined in 2014 recording an average mark of 37.20 % (Karanja, 2016). In the Kenya National Examination Councils report (KNEC, 2015) between 2011 and 2015 Physics recorded an average score and enrollment of 39.09% and 26.62% respectively. The present study was alarmed by trends that were posing serious challenges to the Country’s future in Physics Education, science and technology.

If unchecked, the continued poor performance and low enrollment in Physics will be one of the factors to Jeopardize Kenya's bid to achieve vision 2030; besides entrapping the country in poverty. This is based on the fact that in a single financial year Kenya spends between 17 to 22 percent of her annual budget on Education. For instance in the 2015/2016 budget, the Country spend 28 billion on free secondary tuition plus 3.4 billion on KCSE registration and administration (Republic of Kenya, 2015).

Despite Physics being the cornerstone for the country's industrialization goal and economic growth to middle income economy as envisaged in Kenyan vision 2030 (Republic of Kenya, 2010). This indicates the existing gaps and challenges in Physics curriculum implementation for secondary schools in Kenya. Several Studies (eg., Uside et al., 2013; Muriithi et al., 2013; Njoroge et al., 2014; Kola, 2013; Changeiywo et al., 2010; otieno, 2009 & Forooq, Chaundhry & Shafiq, 2011), established that poor performance and low enrollment in Physics is due to inadequate use of student-centered pedagogies.

Further more studies (eg., Changeiywo et al., 2010; Mkandawire, 2010; Cheplogoi, 2014 & Esokomi, Indoshi & Oduor, 2016), also identified low learners' motivation among students, inadequate teaching and learning materials, limited learning activities in Physics classrooms and poor syllabus coverage as some of the major concerns in Physics curriculum implementation. Unfortunately, fewer studies had focused on instructional influences on the implementation of the Physics curriculum in secondary schools in Bungoma County.

The SMASSE programme which was meant to in-service science and Mathematics teachers in secondary schools in Kenya is one of the very few government initiatives indented to solve the problem. Despite these interventions; Physics KCSE performance and enrollment still remains dismal. Few or none of the studies had been done in Kenya and particularly Bungoma County to investigate instructional influences on the implementation of the Physics curriculum in secondary schools. The concern of this study was that for over a decade, performance in Physics had been low, the subject had been less popular among students in Kenyan secondary schools. The Persistent, poor performance and low enrolment in Physics had been attributed to the use of regular teaching method, low learners' motivation, inadequate learning material, minimal learning activities and poor syllabus coverage.

Thus, investigation into this problem was to provide suggestions on effective implementation of the Physics curriculum. This study contribute to the efforts being made by the Kenyan government, donor agencies and all the players in the Education sector to improve quality of Education in order for the Country to achieve, previous global MDGs, present SDGs and Kenya's vision 2030 (Republic of Kenya, 2007).

1.3 Purpose of the Study

The purpose of this study was to determine instructional influences on the implementation of the Physics curriculum in secondary schools in Bungoma County.

1.4 Objectives

The objectives of this study were to:

1. Establish the influence of teaching methods on the implementation of Physics curriculum in secondary schools in Bungoma County.
2. Determine the influence of learners' motivation on the implementation of Physics curriculum in secondary schools in Bungoma County.

3. Find out the influence of teaching and learning materials on the implementation of Physics curriculum in secondary schools in Bungoma County.
4. Determine the influence of teaching and learning activities on the implementation of Physics curriculum in secondary schools in Bungoma County.
5. Find out the influence of scope and coverage of the syllabus on the implementation of Physics curriculum in secondary schools in Bungoma County.

1.5 Research Hypotheses

For triangulation and attainment of more results from which generalizations and conclusions were drawn. To achieve these objectives, the study employed five null hypotheses, which were tested at 0.05 alpha levels of significance. The study tested the hypotheses that:

$H0_1$: There is no relationship between teaching methods and the implementation of the Physics curriculum in secondary schools.

$H0_2$: There is no relationship between learners' motivation and the implementation of Physics curriculum in secondary schools.

$H0_3$: There is no relationship between teaching and learning materials and the implementation of Physics curriculum in secondary schools.

$H0_4$: There is no relationship between teaching and learning activities and the implementation of Physics curriculum in secondary schools.

$H0_5$: There is no relationship between scope and coverage of the syllabus and the implementation of Physics curriculum in secondary schools.

1.6 Assumptions of the Study

This study assumed that:

1. All teachers are trained on student-centered approaches and are able to employ them in teaching and learning
2. All schools had laboratories and laboratory materials for instruction in Physics
3. The family backgrounds of learners and all school environments are similar, hence equal level of exposure to career guidance and counseling at home and at school.
4. All teachers teaching Physics are trained and qualified as teachers of Physics.
5. Respondents involved in the study gave valuable and correct information worth to be based on in making conclusions and recommendations.

1.7 The Rationale of the Study

The interest to carry out this study emanated from the researchers' teaching experience as a Physics teacher in secondary school for over a decade. It had been noted by Changeiwyo et al., (2010) that Physics could serve several important functions in national development. One of the ways is by preparing students for the huge manpower needed in careers like medicine, engineering, aerospace science; which in turn benefits the general population of a given Country. In contrast, Physics had been identified as one of the subjects that registered dismal performance at KCSE level (KNEC, 2015). Improved educational attainments particularly in sciences are primary to the countries' preparation for global, technology-based change in all sectors.

The Physics curriculum, although embedded in the secondary school mathematics and sciences curriculum, is seen to be critical as Physics plays an important role in preparing individuals in school for workplace (KIE, 2002). The investment in Physics has not always equated to the outcome and results on the ground. For instance, the SMASSE project which was initially donor funded by Japan and presently funded by parents and the government of Kenya does not fully reflect in the students' achievement at the end of the four years of secondary school. Hence need for this study.

In the recent past, Bungoma County faced declining education standards. The County in its' first integrated plan 2013-2017 endeavored to improve education standards by investing in school infrastructure improvement and digital education (Bungoma County integrated plan, 2013). The County also acknowledged that secondary education if well managed enhances economic empowerment through acquisition of relevant life skills that buttress the development process in the prevailing economic and information order (ibid). The changing and increasingly complicated nature in the teaching in secondary schools indicated what was missing in addressing change in status. The change in status could be addressed through effective implementation of Physics curriculum.

The rationale behind was that the education system should produces people that are competent to fill the huge gap of workforce for the growing economy to ensure continues and sustainable development (SDGs, 2015). This development of policies are already in place as mentioned, but have found insufficient investment, skills and driving force to actualize the plans. The insufficiency is attributed to a lack of a good educational-economic investment plan.

The reasons and benefits of effective implementation of Physics curriculum in Kenyan secondary schools are to improve capacity and capability which is inevitable

(Government of Kenya, 2010). The findings of the study provided for an opportunity for teachers to collaboratively improve on their classroom practices. Further provide a guide to the government on the materials required for efficacy in curriculum implementation. Enhanced curriculum implementation arouses learner's interest in Physics by causing a positive attitude which result into improved performance.

1.8 Significance of the Study

This study will help the Ministry of Education identify ways to improve implementation of Physics curriculum and formulate policies pertaining to resource allocation in the improvement of Physics Education in schools. Teachers and laboratory technicians will find this study useful because findings will helps them evaluate their professional practices in Physics Education. The study was also expected to improve practice of teachers of Physics; because the findings and recommendations of this study were expected to provide a process or framework to guide them on how to implement the curriculum effectively. The use of such specific knowledge by teachers will also be relevant for educators in many other countries attempting to implement curricula. Hence, improve the quality and effectiveness in curriculum implementation in schools and raise the standards of science education, particularly Physics in the country.

This study should assist school principals in making decision on how to provide support for effective teaching and learning process by providing more expected support including; teaching and learning material. This study also helps parents to give more support to their children psychologically and financially. The planners and policy makers such as Kenya Institute of Curriculum Development (KICD), KNEC, the ministry of education, school administrators and donors are expected to use the findings of this study as a base for revising the current Physics curriculum in order for the Country to achieve vision 2030 and SDGs. Findings of this study will help Bungoma County by acting as a baseline survey to understand the status of Physics education in the County.

It is hoped that this study will be useful to researchers by contributing valuable knowledge with regard to instructional influences on implementation of the curriculum of Physics in secondary schools in Kenya.

As such, it was expected to add to the existing body of literature on instructional influences on the implementation of Physics curriculum in secondary schools. It should therefore form a useful material for reference to other researchers and other readers in general by shedding light on the implementation of Physics curriculum. Further, findings of the present study were expected to open areas for further study by other researchers and academicians, hence benefiting the whole community.

1.9 Scope and Limitations

1.9.1. Scope

This study on instructional influences on the implementation of Physics curriculum in secondary schools in Bungoma County was conducted between, September, 2017 and October, 2017; through mixed method approach and triangulation design. The study was conducted in 22 public secondary schools selected from a total of 283 from each of the nine Sub-Counties of Bungoma County, Kenya. The researcher provided orientation training to three (3) research assistants for a period of one week (7days) on data collection; master the observation schedules, ethical considerations to be observed and time management

Data was collected by the researcher and three research assistants using teachers' and students' questionnaires, lesson observation schedules and observation checklist tools. The study focused on instructional influences on the implementation of the Physics curriculum in secondary schools in Bungoma County. Out of the many aspects considered was assessing teaching- methods, learners' motivation, teaching-learning materials, teaching - learning activities and scope of the syllabus.

1.9.2 Limitations

Although this study was carefully prepared, the following shortcomings were experienced. First, the sampled public secondary schools, trained teachers for Physics who were Head of Subject (HoS) and form Three Physics students were few and these might not represent the majority of the teachers and students at the secondary school level in Bungoma County. This study looked closely at Physics, one of the three science subject offered in the secondary school curriculum in Kenya. The respondents in this study were teachers and form Three Physics students.

Secondly, this study purposively sampled the form Three Physics students; likely to be few and this might not represent the majority students at the secondary school level in the Country. This was because the form Three students had been in secondary school long enough and understood how implementation of the Physics curriculum is done. The form Four students were over committed in preparation for the national examination, hence unreliable to give information. This study excluded the form Two and One students because they were still new and they might have not adjusted to secondary school environment.

For purpose of generalization, all categories of the school fraternity or stakeholders could have been involved for all inclusive survey. Therefore, the generalization of the findings was limited to trained teachers for Physics in public secondary schools. But to collect more focused information it required participants who well understood Physics as a subject and how Physics curriculum is implemented in secondary schools in Bungoma County.

1.10 Theoretical Framework

This study was guided by the cognitive constructivism theory of learning developed by Jean Piaget (1967). Constructivism theory emerged in the late 1980s, although its roots are much older. Constructivism theory is an alternative to behaviorism theory proposed by Skinner in 1961 which the researcher felt cannot suffice because of its emphasis on learning as an observable change in behavior; not caused by physical maturation or growth (Romiszowski, 1990).

The basic belief of constructivism is that knowledge is actively constructed by learners rather than transmitted by the teacher (Jonassen, 1991). Nevertheless, there are minor distinctions between cognitive constructivism and social constructivism, which are two representative types of constructivism (Hirumi, 2002; Liaw, 2004).

However, in adopting constructivism theory for this study, the researcher was not ignorant of its shortcomings. Cognitive constructivists believe learners construct knowledge individually based on their prior experience and new information. Therefore, learning is considered as an internal cognitive activity. Social constructivists, however, argue that knowledge is the outcome of collaborative construction in a social context through interactive processes of information sharing, negotiation and discussion (Qiyun, 2008). Therefore, the social constructivist views learning as knowledge constructed through social interaction and discourse (Hirumi, 2002; Liaw, 2004).

This study was inclined to cognitive constructivism in which Physics as a science subject require learner activities using learning materials for effective learning and curriculum implementation. Although varying constructivist theories exist, there is agreement between the theories “that learning is a process of constructing meaning, it is how people make sense of their experience” (Jonessen, 1991).

Constructivists believe learner centric instructional methods in the classroom will strengthen the commitment and involvement of self-motivated learners because of their high level of interaction. In adapting this theory, this study views teaching methods like; Inquiry-Based Teaching, laboratory method, Project method, Discovery method, Mastery Learning Approach and ICT integration as methods that allow Knowledge construction in the teaching and learning process. This theory is related to this study in that the study sought to establish the influence of teaching methods on the implementation of the Physics curriculum in secondary schools in Bungoma County.

The cognitive constructivist learning theory relates to this study by reminding teachers to look for different ways to engage and motivate an individual learner by preparing coherent problem sets and challenges that focus the model building effort and interpretations (Qiyun, 2008). In line with cognitive constructivists theory this study sought to determine the influence of learners’ motivation on the implementation of Physics curriculum in secondary schools in Bungoma County.

Based on constructivism learning theory, the learning environment (school) must provide certain materials or tools so that the students can easily manipulate. In addition, teachers are facilitators in a constructivist learning environment; the pedagogical design must enable teachers to provide various learning resources

(Learning materials) and learning activities (Qiyun, 2008). In relation to constructivist theory, this study sought to find out the influence of learning materials on the implementation of the Physics curriculum.

Cognitive constructivists assert that learners build knowledge actively through the interactions in the teaching-learning activities within the learning environmental. The constructivist learning methods involves educators implementing curriculum using experiences of their learners who are active in the learning process. Cognitive and social learning constructivist theories give strong support to the design of pedagogical and social activities, respectively. The activities cause stimuli for learning. In addition, teachers are facilitators in a constructivist learning environment; the pedagogical design must enable teachers to provide various learning resources (Learning materials) and learning activities (Qiyun, 2008).

The instructor is responsible for making sure the information is in a format the students can comprehend. In other words, learning focuses on the learner's questions and exposure. In agreement with constructivist theory this study sought to determine the influence of teaching-learning activities on the implementation of Physics curriculum in secondary schools.

Based on cognitive constructivism, pedagogical design must support and satisfy the needs and learning intentions of individual learners. Therefore, the scope of the syllabus should not be a rigid frame to be covered in a specific period of time because unplanned knowledge can be acquired in the process. When applying this theory to independent learning, it was essential to understand that individual learners can construct different knowledge even given the same condition Jonessen (1991). In relation to constructionist theory, this study sought to find out the influence of scope of syllabus on the implementation of Physics curriculum in secondary schools in Bungoma County.

Therefore, cognitive constructivist theory was relevant guide to this study on instructional influences on the implementation of Physics curriculum in secondary schools, since it stresses on the fact that teaching methods and activity learning need to be learner-centered for effective curriculum implementation. It emphasized on provision of learning material that leads to motivation to learn, a flexible scope of the syllabus, hence effective implementation of curriculum in secondary schools.

1.11 Conceptual Framework

This study was guided by a schematic model. In this model research variables and the relationship between them is shown diagrammatically. Independent variables (IVs) are placed on the left and dependent variables (DVs) on the right separated by the intervening variables in the middle. The conceptual framework in this study is represented diagrammatically in figure 1.1.

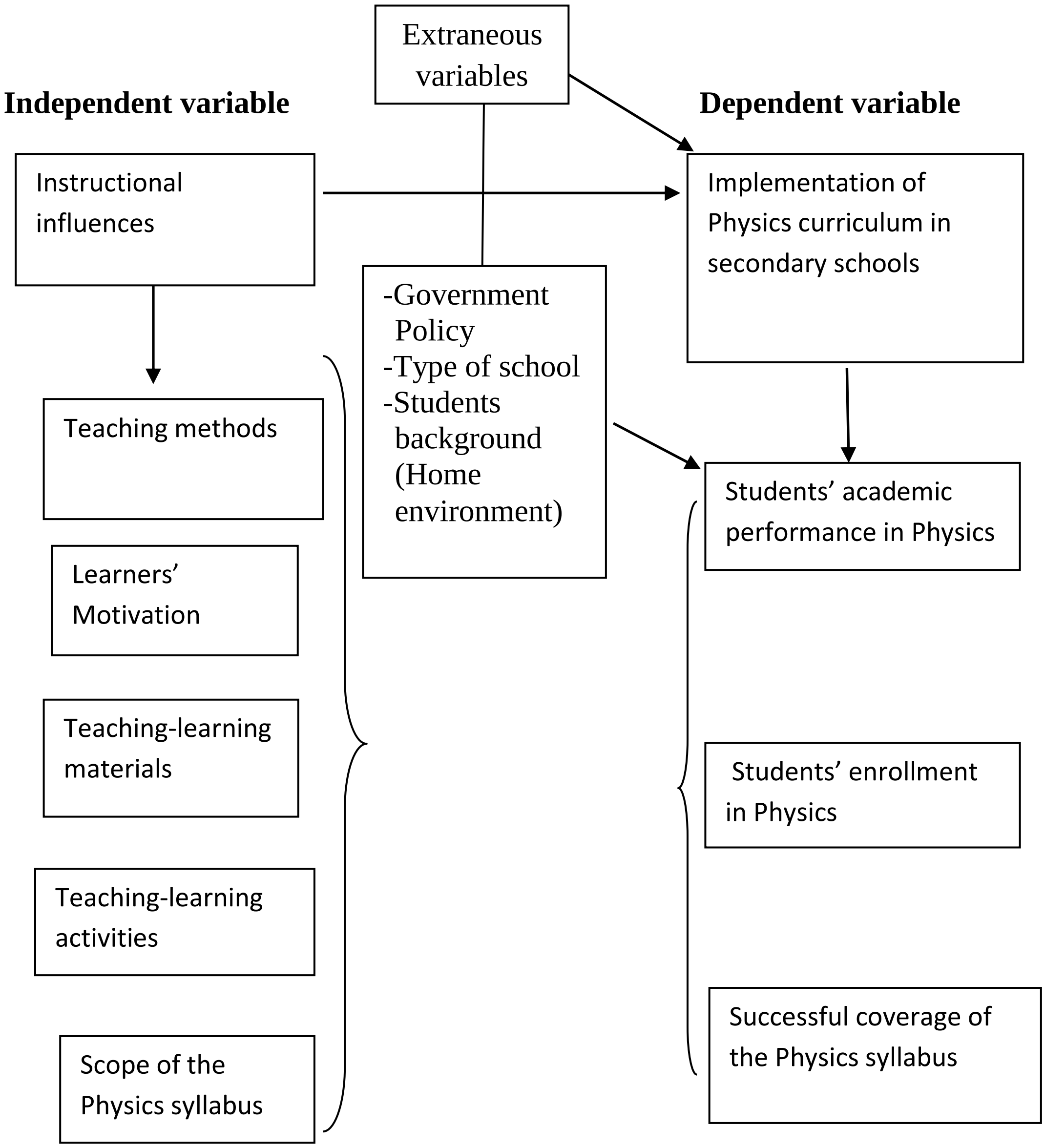

Figure 1.1: A Conceptual Framework for the Relationship between Instructional influences and Implementation of Physics curriculum.
Source: Researcher (2015)

In the conceptual framework depicted in Figure1.1, instructional influences are hypothesized to influence implementation of Physics curriculum in secondary schools. Instructional influences are defined as teaching methods, learners' motivation, teaching-learning materials, teaching-learning activities and scope of the Physics syllabus.

Implementation of Physics curriculum is hypothesized as students' academic performance, student's enrollment in Physics and successful coverage of the syllabus. The framework postulates that teaching methods, learners' motivation, teaching-learning materials, teaching-learning activities and scope of the syllabus influenced implementation of the curriculum in secondary schools (students' academic performance, students' enrollment in Physics and successful coverage of the syllabus). However, this relationship may be modified by government policy, type of school and family background from which the student comes.

1.11.1 Variables

The independent variable (IV) in this study was instructional influences. The operational form of the independent variable was; teaching methods, learners' motivation, teaching-learning materials, teaching- learning activities and scope of the syllabus. The dependent variable (DV) in this study was implementation of Physics curriculum. The operational form of the dependent variable is; students' academic performance, students' enrollment in Physics and successful coverage of the syllabus. The extraneous variables (EVs) in this study were; government policy, type of school and students.

1.12 Operational Definition of Terms

Curriculum: Curriculum refers to planned subject content, teaching methods employed, materials provided and activities experienced in order to achieve set objectives or outcomes

Enrollment: refers to the number of students choosing to study Physics at form three and form four in secondary schools.

Implementation: a process of enacting the curriculum or educational program produced during the previous stages of the curriculum cycle.

Influences: influence is to have an effect on a particular situation and the way something is developed or its outcome/results.

Instruction: Instruction is a subset of education and refers to the systematic planning and management of all activities the teacher and the learners engage in while interacting with content and materials of the program during the learning process.

Learner: A learner is a person undergoing instruction in an educational institution, therefore as used in this study a learner is a secondary school student taking physics.

Learning Activities: refers to the scientific procedures performed by learners like; experimenting, observation, recording results, analyzing the results and making conclusions.

Motivation: Motivation refers to an inner drive towards physics, developing interest to study Physics and pass the Examination with a high mean grade. Motivation can either be intrinsic or extrinsic.

Performance: are the outcome results in Examinations like KCSE, in terms of percentage or mean grade; A, B, C, D or E, plus the subject mean score and school mean score.

Physics: In this study Physics refers to one of the three science subjects (Chemistry, Biology & Physics) offered in the secondary school curriculum that is critical for producing science and technology human resource needed for Kenya to achieve vision 2030 and SDGs.

Public secondary schools: public secondary schools are government funded secondary schools in Kenya.

Scope and coverage of the syllabus: it is the effective implementation of the curriculum by achieving all set objectives for a given class on time resulting to high sores in KCSE examinations.

Syllabus: Syllabus refers to the number of topics or content to be covered in a specific period of time like; one year or four years.

Teaching-learning materials: are any instruments, devices or resources that aid the teacher and the learner in realizing his/her objectives in the teaching-learning process. These include; textbooks, laboratory apparatus and computers.

Teaching methods: Teaching methods refers to learner-centered learning process where most learning activities are performed by the learner; the teachers' role is minimal but vital; to facilitate learning by providing resources required and guiding activities for achievement of the learning objectives.

1.13 Chapter Summary

This chapter started by briefly presenting the background which lays the basis for the study. This was followed by description of the problem statement, objectives and research questions. Brief explanations of assumptions of the study, rationale of the study and significance of the study were made to indicate the importance and reasons for the choice of the study. The scope and limitations of the study were explained to give the boundaries of this study. The theoretical framework and conceptual framework were discussed to link the study with existing learning theories and research philosophy. The chapter ends with operational definition of key concepts to clarify what they mean in the study. The next chapter deals with literature review in a more detailed manner to show the relationship between instructional influences and implementation of Physics curriculum in secondary schools in Bungoma County.

CHAPTER TWO

LITERATURE REVIEW

2.0. Introduction

This chapter describes literature related to the research objectives of the study. It is organized into sub-sections. The literature is discussed under the following sub-headings: history and development of Physics Education, role of secondary Education in society, Physics in Kenyan secondary school Curriculum, academic achievement in Physics, methods of teaching Physics, learners' motivation to learn Physics, teaching-learning materials, teaching-learning activities and scope of the syllabus, effective implementation of Physics curriculum, related studies, research gap and Chapter summary.

2.1. Historical Background for Physics Education

Aristotle wrote what is considered now as the first book of Physics. Aristotle's ideas about motion weren't displaced until the end of 17^{th} century, when Isaac Newton published his ideas (Olumuyiwa & Okunolo, 1992). In 1872 Harvard University established Physics as a college entrance requirement, chemistry and biology were added latter, these universities requirement for admission dictated secondary school course and spurred the beginning of science curriculum (Andrews, 2006). Before the beginning of the nineteenth century, the study of science was either a hobby of the few people with means or solitary effort of someone with scientific talent. Since then science has developed to a level where we today live in scientific civilization in which science is no longer confined to a few individual or countries that are devoted (ibid).

Physics is a branch of Physical sciences that concerns mainly with matter in relation to energy (Olumuyiwa & Okunola, 1992). Physics is an important base of science and technology because it is concerned with natural phenomena and help people understand the increasing changing technological society (Changweiywo et al., 2010).

Today's Physics students keep thinking of Physics concepts in Aristotelian terms; despite being taught only Newtonian concepts. Historically, Physics has been taught at the high school and college level primarily by the lecture method accompanied with demonstration, hands-on experiments. Questions that require students to ponder on what will happen in an experiment and why? In contrast the developments in science and technology in the 21^{st} Century has changed the teaching and learning approaches by the introduction of computers in classroom; particularly in developed and developing countries. Other developments in the resent past have been demands for equal rights and opportunity by women in the science and technology fields. The Kenyan constitution adopted in 2010 motivated the demand for equal opportunities for all people, Education included (Republic of Kenya, 2010).

Physics has been acknowledged as a pre-requisite for the study of several high-profile courses at the university for example; engineering, medicine, aerospace, technology and other applied science courses (KUCCPS, 2014). The subject has many applications for example in medicine; where throughout this Century advances in Physics and medicine have gone hand in hand. Medical community devices; new techniques for diagnosing and treating a variety of illness has rapidly exploited the most fundamental discoveries in Physics. Even in the continuing research necessitated by the challenges posed by diseases such as Ebola, and HIV/AIDS, the development of high precision equipment employing principles of Physics remain necessary (Minishi, Muni, Okumu, Mutai, Mwangasha, Omolo & Munyeka, 2004). Information technology has reduced the world into a global village through the use of satellites and computers, the use of Physics knowledge and skills, has been very critical. A wide range of applications of Physics is used in industrial development for improvement of the well being of human lives. Physics knowledge and skills are applied in food production, preservation, transport system, telecommunication and energy production and conservation. Therefore Physics affects all aspects of human life (ibid).

In view of the obvious importance of Physics in scientific and technological advancement of any nation and its usefulness in nearly all fields of human endeavor, the poor performance of students at secondary school level in Kenya at large and in particular Bungoma County has been a source of concern for various stakeholders in Education as it is for this study. According to a previous study by Ngoroge et al., (2014) many factors are attributed to this poor performance in secondary Physics. Other studies including (eg., Woudo, 2010; Wambugu & Changeiwywo, 2008 & Semela , 2010) attributed the poor performance to insufficient man power, poor teaching methods, inadequate learning materials, poor attitude, lack of understanding of concepts due to their difficult nature and failure to use modern technology in instruction.

2.2 Role of Secondary Education in Society

Education plays a vital role in the development of human capital and is linked with an individuals' well-being and opportunities for better living. This had been acknowledged by the MDGs whose deadline was December 2015(MDGs, 2000). For 15years starting 2000 to 2015, Kenya was implementing the global MDGs and in line with the MDGs, the Kenyan Basic Education Act, No.14 of 2013 which states in part, "no public school should cause any parent or guardian to pay tuition fees for pupils in school", (Republic of Kenya, 2013)

The Kenyan government has since independence recognized the role of Education as a cornerstone of socio-economic development and a means of improving the welfare of individuals and society at large (Hennessy, Ongutho, Harrisson, Namalefe, Naseem & Wamakote, 2010). A study by Kenya National Bureau of Statistics (KNBS) in 2013 established that investment in Education guaranteed higher individual returns than investment in alternative sectors of the economy.

Education is therefore typically vied as a powerful factor in leveling the field of opportunity as it provides individuals with the capacity to obtain a higher income and standard of living. Kosgei, Kurgat, Keter and Kisilu (2014) noted that Education is viewed as legitimate in terms of both individual and collective good, resulting into explosive growth both in National and Global arena. UNESCO (2010) observed that provision of quality Education is important in generating the opportunities and development. Inequality in quality and access to Education often translates into differentials in employment, occupation, income, residence and social class (KNBS, 2013).

The studies by Hennessy et al., (2010), KNBS (2013) and Kosgei et al., (2014) relate in that they all emphasis the importance of Education in an individual economic return and status in society. Secondary school Education in Kenya aims at ensuring that students graduating at that level had adequate scientific knowledge by meeting the needs of those who terminate their studies after secondary school and those who proceed to tertiary institution (KIE, 2002).

Secondary Education has been perceived as a critical level in any Educational system and the overall development of a Country (Njoroge et al., 2014). As a transitional level to higher level of Education, it is important for economic development of a nation, socialization and empowerment of the youth who are faced with massive levels of unemployment (UNESCO, 2005). All over the world secondary level of Education plays the following critical roles:

First, secondary education is critical for economic growth and development (UNESCO, 2002). In addition, it provides a link between primary Education and further learning and training. Secondary Education is the bridge in the whole Education system in Kenya. The success or failure in secondary Education will be carried over to the tertiary and university level of Education (Semela, 2010).

Secondly, secondary level of Education contributes to the socialization process of young people, who are at risk of losing the social and moral value (UNESCO, 2004). Thirdly, secondary education provides return and offers young people the opportunity to acquire human capital which enables the youth to develop job-oriented skills, participate fully in the society, take control of their own lives and continue learning (Government of Kenya, 1999).

Therefore, effective implementation of Physics curriculum for secondary schools is crucial to the success of the whole Education system and the achievement of the country’s vision 2030. The researcher felt that instructional influences on the implementation of the Physics curriculum should provide the insight into the issue of Physics Education and the whole Education system in Kenya.

Ayiro (2015) has demonstrated that; one of the basic requirements of education for the future is to prepare learners for participation in the society. An information society is one in which knowledge is the most critical resource for social and economic development. This is when distributed expertise and networked activities characterize the emerging types of work. As secondary schools became more focused on the general Education for all students, science was introduced to help students deal with personal and social problems (Momanyi, Ogoma, & Misigo, 2010).

Education institutions are therefore required to adopt appropriate pedagogical methods to align and cope with these new expectations. While researchers have informed policy makers in many countries to equip school with ICT and to provide teachers with required skills, the shift towards constructivist-oriented pedagogies is still not a salient feature in schools (Ayiro, 2015).

The Sustainable Development Goals (SDGs) will be achieved by 2030 through inclusion of vocational training, information and communication technology, technical, engineering and scientific programs among others (SDGs, 2015). Sustainable development of a nation depends on provision of quality Education to its people. Quality Education is measured by academic performance in national examinations at any given level. Unfortunately, for over a decade, performance in Physics examinations at KCSE level has been poor registering an average of 39.0 percent, coupled with alarmingly low students' enrolment of 26.62 percent (KNEC, 2015). This precedence may provide a major impediment to the country effort to achieve vision 2030, given that most technological courses at College and University require a good pass in Physics (Kenya Universities and Colleges Central Placement Service [KUCCPS], 2014).

This raises a concern about the appropriateness of methods employed in Physics instruction in the classroom. There has been a paradigm shift in the world currently from analogue to digital platform in communication, business and education (Hennessy et al., 2010). Therefore, there is need for the instructional methods in Physics to be aligned with the change in technology. Hence, need to ensure effective curriculum implementation in order to improve practice and performance in the subject.

However, there is little documentary evidence to show the influence of instructional factors on implementation of Physics curriculum in secondary schools in Kenya. There is legitimate fear that if the trend was not checked. The hallowed status of quality in the implementation of the curriculum of Physics in secondary schools will be severely compromised.

2.3 Physics in the Kenyan Secondary School Curriculum

In Kenya, numerous curriculum reforms aimed at making Education responsive to the national development goals have been mad. Bajah 1980 (as cited in Sadie, 2011) noted that curriculum reforms in the west also filtered into many African counties like Nigeria and Kenya. A number of curriculum reforms in science Education in Kenya have been made. Such curriculums reforms included; Nuffield science project of 1966, UNESCO science project of 1969 and School Science Project (SSP) of 1974 and now the 8-4-4 curriculum (World Bank, 2008).

This literature informs this study that school science has developed only towards the end of the nineteenth century. The 8-4-4 education system was launched in January 1985 and was designed to provide eight years of primary, four years of secondary and four years of university education (Ministry of Education Science and Technology [MOEST], 2005).

The 8-4-4 Education system aimed at introducing vocational and technological Education practical, so as to meet the demands of the economy by fostering national development, providing a relevant curriculum for the Kenyan youth by addressing the economic and regional disparities and providing a practical oriented curriculum (MOEST, 2005). Thus, the system introduced a broad based curriculum at every level. Science subjects were initially classified into Chemistry, Physics, Biology, Biological sciences and Physical sciences.

However, the science curriculum has undergone several structural and fundamental changes and currently pure sciences are offered in all secondary schools in Kenya (KIE, 2002). According to KIE (2002) Physics is clustered with Biology and Chemistry as science subjects; amongst which a student has to select at least two as compulsory subjects at form Three and Four. Majority of the students opt for a combination of Chemistry and Biology due to subject clustering system which does not favor Physics.

This is because most of the students consider the concepts involved in the study of Physics to be too abstract and difficult to understand (Semela, 2010). This may account for the current low students' achievement, motivation and enrollment in the subject. Performance in Physics has been low and many students shun the subject as indicated in Table 1.1 and Table 1.2, which shows that performance in Physics has been poor and the subject is unpopular amongst secondary school students compared to Chemistry and Biology.

This study investigated the instructional influences on the implementation of Physics curriculum in secondary schools with a view of establishing how the implementation of the curriculum has tended to respond to modern reforms in science Education in general and Physics in particular. Several studies have investigated the causes of the appalling state of Physics performance and low students enrollment in Kenya (e.g., Uside et al., 2013; Muriithi et al., 2013 & Njoroge et al., 2014).

These causes were identified as use of regular teaching approaches, low learners' motivation, inadequate instructional materials, poor content mastery by the Physics teachers, poor language use by teachers in classrooms, perceived difficulty of the subject, and inadequate supervision of learning materials by MOEST among other factors (SMASSE, 1998; Ndirangu, 2000 & Oyoo, 2009).

The SMASSE project has been advocating for improvement on teaching methods, reducing gender disparity, motivation of learners to choose Physics in order to increase enrolment, provision of teaching and learning materials for learner-centered approaches in teaching (Njoroge et al., 2014).

The study of Physics involves pursuit of the truth and hence instills diligence, honesty, perseverance, observation skills, patience and objectivity among learners. Physics learning develop the scientific habits in students which are transferrable to other areas in life. Such habits involve non-reliance on superstition, critical thinking and respect for other people's opinions (KIE, 2002).

Physics Education therefore enable the learner to acquire problem-solving and decision-making skills that provides ways of thinking and inquiry; helping them respond to widespread and radical changes in industry, health, climate changes, information technology and economic development (Kagwiria, 2013). The teaching of Physics provides the learner with understanding, skills and scientific knowledge needed for scientific research, fostering technological and economic growth in society where they live thus improving the standards of living (KIE, 2002).

In the 8-4-4 Education system in Kenya, the Physics curriculum has set eleven general objectives for the Physics learner. According to (KIE, 2002 p.44) syllabus they are stated as follows: By the end of the course, the learner should be able to:

> (i) select and use appropriate instruments to carry measurements in the Physical environment, (ii) use the knowledge acquired to discover and explain the order of the Physical environment, (iii) use the acquired knowledge in the conservation and management of the environment, (iv) apply the principles of Physics and acquired skills to construct appropriate scientific devices from the available resources,(v) develop capacity for critical thinking in solving problems in any situation, (vi) contribute to the technological and industrial development of the nation, (vii) appreciate and explain the role of Physics in promoting health in society, (viii) observe general safety precautions in all aspects of life, (ix) acquire and demonstrate a sense of honesty and high integrity in all aspects of Physics and life in general, (x) acquire positive attitude towards Physics, (xi) acquire adequate knowledge in physics for further education and/or training (KIE, 2002).

Despite that the general aims and objectives of Physics Education in Kenya are inclined towards achieving scientific productivity and technological development, little has been achieved. Today the teaching and learning in Physics classrooms in the Country is still the old type lecture method. Moreover, the recognition given to Physics as one of the essential science subject at the secondary school level as contained in the National policy of Education (Government of Kenya, 1999). The students' academic achievement and enrollment is still low, hence worrying Educators and researchers.

According to Oduor (2016, p.2) Kenya is grappling with an estimated gap of about 30,000 engineers, 90,000 technicians and 400,000 artisans: this is according to Education strategy paper for 2014-2018. "The shortage of middle level technicians and artisans is hampering the country's economic growth prospects," reads the African Development Bank Group (ADB) report. The document says; Kenya Engineers Registration Board (KERB) estimated the ratio of engineers, technicians and artisans required by the country to achieve middle-income economic status at 1:12:60.The current ratio is estimated at only 1:3:60. Data from the Ministry of Education indicates that the accepted ration of engineers, technologists, technicians and artisans is 1:3:12:60.

Therefore, Technical Vocational and Entrepreneurship Training (TVET) do not train individuals, but train a team. So this ratio is the required unit production team and different sectors require different ratios and the gaps vary too (Oduor, 2016 p.2). This is an indicator that Physics curriculum implementation in secondary schools in Kenya must be improved for the country to meet the gap in science and technical fields.

Many researchers; Njoroge et al., (2014); Muriithi et al., (2013), Kola, (2013), Mboto and Udo, (2011) and Changeiywo et al., (2010) identified different solutions among them is the use of different instructional methods such as discovery method, project, mastery learning, inquiry based and ICT integrated as the possible solution to the problem.

Njoroge et al., (2014) confirmed that the use of appropriate instructional strategies can influence the performance of low achieving students as well as making the lesson interesting. With these understanding, policy makers can design a better curriculum to make Physics teaching effective because the subject is critical to the realization of

Kenya vision 2030. Teachers can plan on addressing their hindrances to effective implementation of Physics curriculum in secondary schools. Scholars can better understand the mechanisms that can be employed in managing instructional influences on the implementation of Physics curriculum secondary schools.

2.4 Academic Achievement in Physics in Secondary Schools

Science has been regarded as the bedrock of modern day technological breakthrough (Aina, 2012). Nowadays, countries all over the world, especially the developing ones like Kenya, are striving hard to develop technologically and scientifically. Since the world is turning scientific and all proper functioning. Today lives depend greatly on scientific disciplines such as Physics, Chemistry and Biology.

The quality of students' performance remains a top priority for education in Kenya (KNEC, 2015). It is meant for making a difference locally, regionally, nationally and globally. Unfortunately, performance in Physics examinations and enrollment in secondary schools in Kenya has been quite dismal for over a decade (KNEC, 2015),

Yet most technological courses that spring national development as envisaged in vision 2030 require a good pass in physics (KUCCPS, 2014). Most of the previous studies (e.g., Kola 2013; Muriithi et al., 2013; Njoroge et al., 2014; Uside et al., 2013 & Wambugu & Changeiywo 2008) focused on teaching approaches affecting students' performance in Physics in secondary schools in Kenya

What was shown by these studies was the fact that a number of instructional influences affect the implementation of Physics curriculum in secondary schools in Kenya. It was against this background that this study was set to determine instructional influences on the implementation of Physics curriculum in secondary schools in Bungoma County.

A study conducted in South Africa on “Factors associated with high school learner’s poor performance in Physics” by Mkgato and Andile (2006) identified teaching strategies, content knowledge, motivation, laboratory use and non-completion of the syllabus in a year as some of the influences. Other studies done on the same area in Kenya like; Muriithi et al., (2013); Uside et al., (2013) and Njoroge et al., (2014) investigated the cause of the appalling state of Physics performance and low enrollment. The researchers identified, poor teaching approaches used by Physics teachers, low students’ motivation to learn Physics, poor content mastery by teachers, perceived difficult of the subject, inadequate instructional materials and failure to use technology in classroom among other factors. This situation does not favor Kenya’s move towards developing a scientific and technology nation (Changeiywo, 2002). Thus, there is need to address the prevailing poor status in Physics education and specifically implementation of Physics curriculum in secondary schools in Bungoma County.

Many investigations have shown that secondary school students are exhibiting dwindling interest coupled with dismal performance in sciences (Momanyi et al., 2010; Isolo, 2011; Kola, 2013 & Oladejo, Olosunde, Ojebisi & Isolo, 2011). Physics as one of the science subjects remains one of the most difficult subjects in the school curriculum according to the Nigeria Educational Research and Development Council [NERDC] (Isolo, 2011). A study by Kola, (2013) revealed that performance of Nigerian students in ordinary level Physics was generally and consistently poor over the years. Physics students’ performance in West African Examination Council (WAEC) in Nigeria from 2005 to 2009 is shown in Table 2.3.

Table 2.3: Students' Performance in WAEC Physics in Nigeria from 2005 to 2009

YEAR	Average percentage (%)	Standard Deviation
2005	41.50	40.96
2006	43.84	42.71
2007	58.05	56.84
2008	48.26	49.10
2009	43.56	43.23
Average	**46.60**	**46.56**

Source: WAEC Office Yaba, Lagos, Nigeria (2013)

There is close similarity in performance in Physics in Kenya and Nigeria, both of which display poor results as indicated in Table 1.1 and Table 2.3 respectively. Performance in Physics in Nigeria seems to be slightly better compared to that of Kenya but with a very small margin. Reasons for this poor achievement cannot be separated from deficiency in teachers' curriculum implementation and students' poor interaction with content as highlighted before and also attributed to many other factors; one of such reasons being teachers' strategy (Oladejo et al., 2011).

Njoroge et al., (2014) studied the effect of Inquiry-based teaching approach on secondary school student's achievement and motivation in physics in Nyeri County and observed that the poor performance in Physics may be attributed to inappropriate teaching methods and approaches used by Physics teachers, poor distribution and utilization of school resources, low student motivation to learn Physics and incompetence in science processes and skills amongst secondary school Physics students among other factors (Njoroge et al., 2014).

There is need to address this problem in order to improve academic performance and increase enrollment in the subject. Studies on (KCSE) Physics performance have been steadily growing. Most studies examined the factors affecting students' performance in Physics, practice regarding Physics and teaching methods, noting the pressing need for innovations that can promote effective curriculum implementation (e.g., Otieno, 2009; Kola, 2013 & Btissam & Nadia, 2014). Other studies that considered performance in Physics (e.g., Njuguna 1998; woudo, 2010 & Nderitu, 2011) established that there was over reliance on conventional methods of teaching like lecture, question/answer and teacher demonstration. These methods limit chances of students' participation in the process of learning due to their inflexibility.

In Kenya in 2012 and 2013, the Minister of Education, Parents, political leaders, psychologists, and other stakeholders complained about poor performance in sciences in KCSE examinations and as a result a team of experts was appointed to investigate the matter and report for action (KNEC, 2015). However, this has been the trend and previous ministers in the ministry of education have promised to deal with the challenge, but little has been done. This situation raises questions about the methodology employed in Physics instruction in Kenyan secondary schools

Wambugu and Changeiywo (2008) classified Physics as a difficult subject, not popular, avoided by students and with dismal performances in Kenya. Discontent with the academic performance in Physics by students in national examinations has been an issue of concern since the start of the 8-4-4 system of education. Momanyi et al., (2010) noted that the declining in performance is worrying given the fact that Kenya vision 2030 in anchored on the sound performance in Mathematics and science subjects.

The persistent drop continues despite government laying down many strategies including the starting of a Centre for Mathematics, Science and Technology

Education in Africa (CEMASTEA), provision of laboratories and equipments (CEMASTEA, 2015). Bandura (1997) noted that intellectual capability and motivation influences academic performance. Physics curriculum at secondary school level comprises of the following branches: mechanical properties of matter, waves, optics, magnetism, electromagnetism, electronics, heat, modern, and quantum physics. The listed branches of Physics have been said to be so demanding in terms of mathematical skills for one to be able to understand (Semela, 2010).

Physics is a key science subject expected to drive Kenya's vision 2030 initiative which aims at making the country a newly industrialized middle income country by providing high quality life for all its citizens (Republic of Kenya, 2007). The realization of this vision calls for the harnessing of the science and technological ability of both men and women in the country. Hence, it is a collective responsibility of both genders. Amunga et al., (2011) established gender disparities in different school categories in physics academic achievement in secondary schools in Western province as indicated in Table 2.4.

Table 2.4. Students' Performance Mean score in KCSE Physics in Western Province from 2005 to 2009

Year	Mean Scores for Different School Category		
	Boys Boarding	**Girls Boarding**	**Co-education**
2005	6.960	5.982	4.326
2006	7.491	6.115	4.211
2007	7.372	5.812	4.016
2008	7.410	6.113	4.575
2009	7.178	5.553	3.939
Average	**7.281 (C+)**	**5.915 (C)**	**4.201 (D+)**

Note: Figures in parenthesis are respective mean grades
Source: Provincial Director of Education [PDE], Western Province, (2010)

It is seen from Table 2.4, that all the school categories experienced fluctuation in Physics performance as indicated by the mean scores. The findings also indicated disparities in Physics performance in the school categories. Boys boarding schools had a better performance with a score averaging at 7.281(C+) followed by girls boarding schools with an average mean score of 5.915(C). Mixed day schools had the lowest performance with an average mean of 4.201(D+). The results indicate that performance in Physics seem to favor boys than girls and those students in boys' boarding schools. The enrollment and performance in Physics in Kenya is below the expectations that Kenya would require to actualize her goal of industrialization and becoming a middle level income country by the year 2030 (Republic of Kenya, 2007).

The Kenya vision 2030 stipulates that science and technology shall be one of the central aims of education system (Republic of Kenya, 2007). The rationale behind this is that Kenya needs a huge workforce for its growing economy to ensure continuous and sustainable development to enable the country become a middle income economy by the year 2030 (ibid).

The KCSE report for the 2015 on students' performance advised teachers to give plenty of exercises, guide students into the insight of the concept taught and to cover the syllabus within the allocated time (KNEC, 2015). Hence, the poor performance reflect the challenge Kenya faces in having adequate number of qualified students enrolling in scientific and technological disciplines in educational and training institutions in the country.

2.5 Influence of Teaching Methods on the Implementation of Physics Curriculum in Secondary Schools

A teaching approach is a way of thinking or reasoning in teaching. It is actually a philosophy of instruction, and can be viewed from the perspective of either content or centre of interest (Mwaka, Kafwa & Musamas (eds), 2014). While a teaching strategy is defined by many scholars in different ways: Nasibi (2003) defined a teaching strategy as a way and means of organizing and facilitating learning experiences. Twoli (2007) defined teaching strategy as the overall way in which the process of instruction is organized and executed.

Teaching method is defined by Mwaka et al., (2014) as description of the learning objectives oriented activities and flow of information between the teacher and learners; they comprise a coherent set of techniques put together in presenting instruction materials or conducting instructional activities. In modern methods of teaching, the learner is at the centre of most learning activities and the teacher's role is to facilitate, guide and provide suitable resources required for the achievement of the instructional objectives. This approach is also referred to as heuristic or discovery approach and is related to heuristic strategy.

Learner-centered approaches emphasis the development of the individual (Otunga, Odero & Barasa (eds), 2011). The respective teaching methods discussed in this literature are also based on the research and experiences of Italian Physician and educator; Maria Montessori (1870-1952). The philosophy of Maria Montessori is "the child's true normal nature" children are given freedom in an environment prepared with materials designed for their self-directed learning activity (Mukwa & Too, 2002). Applying this approach involves the teacher in viewing the child as having an inner natural guidance for his/her own perfect self-directed development. The role of the teacher is therefore to watch over the environment and remove any obstacles that would interfere with this natural development. This approach therefore implies that children ought to be exposed to appropriate learning experiences for intellectual growth (ibid).

Physics teaching involves students to use their knowledge, beliefs, cognitive and affective through processes to generate new, fruitful, and transferable conceptions that have personal and every day meaning and significance (Feyera, 2014). As a result, effective Physics teaching leaves students with ability and motivation, to solve problems scientifically and carry out scientific investigations. Hence, effective instructional strategies involve knowledge of multiple methods or activity sequences that lead to successful student learning and a specific concept or process skills (ibid).

In Kenya, Physics teaching is geared around memorization of basic concepts and their reproduction in examinations. The students who enroll for the subject resort to cramming definitions and formulas. Usually the performance in Physics is among the worst among all the subjects at the secondary school level (KNEC, 2015). The use of student-centered teaching methods and implementing teacher professional development has also been suggested as possible solutions (SMASSE, 1998).

In response to the low students' achievement and motivation to learn physics SMASSE project organized National and District In-service Training (INSET) for teachers emphasizing the need to adopt; Activity Student Experiment and Improvisation/Plan Do See and Improvisation (ASEI/PDSI) teaching approach. The ASEI/PDSI approach, which means Activity Student Experiment and Improvisation and Plan Do See and Improve respectively, advocated for a paradigm shift from teacher-centered to student-centered physics teaching methods (SMASSE, 1998).

The findings by UNESCO urged for more infusion of content on science, technology and innovation into the secondary school curriculum so as to develop the requisite skills in the learners (UNESCO, 2010). All these curriculum reforms advocated for an approach to science teaching and learning which required a complete overhaul of the conventional teaching practices and adoption of modern learner centered approach to teaching and learning.

Introduction of new learning experiences and modern teaching strategies to improve Physics curriculum implementation in secondary schools has to start from early school years (Semela, 2010). However, the immediate application of learner-centered approaches is beyond the reach of most current education system in Sub-Saharan Africa (SSA). The modern pedagogies attempted may be appropriate for a few private schools, but for majority of African teachers and classrooms they are not suitable (World Bank, 2008). ICT integration is one of the modern student-centered pedagogies that have been encouraged as being adaptable to the 21st Century (Kola, 2013).

Other teaching methods advocated for as appropriate for teaching Physics in Kenya by different scholars include; Inquiry-Based Teaching by Zheng & Geelan (2013), supported by Njoroge et al., (2014).

Practical approach is advocated for by Kaptingei & Rutto (2014) while Project method by Muriithi et al., (2013). Discovery method proposed by Uside et al., (2013) while Mastery learning approach by Changeiywo et al., (2010). All these approaches and methods may be applied with the intention of improving enrollment and achievement in the subject.

Teaching methods used in Physics instruction have been identified as one of the factors contributing to the low students' enrollment and achievement in the subject among other factors (American Association of Physics Teachers, [AAPT], 2009). Thus a teaching method a teacher adopts may motivate students to learn and therefore affect their achievement in Physics. Therefore it should be noted that there are many factors that have negative effect on curriculum implementation, it has been observed that the nations' economy plays a vital role in as far as the implementation of the curriculum is concerned.

The availability of learning resources required in the education system to facilitate effective teaching and learning process depends on the economy of the country. To a large extent even the learners' well-being in terms of good health and nutrition is also determined by the nation's economy. In view of this, curriculum developers, adopters and implementers should be mindful of destructors. Such as these discussed in this literature and address them adequately in order to minimize the impediments on implementation of Physics curriculum in secondary schools in Kenya.

Overall, these challenges must provide the impetus for reforming the entire education system, ranging from the teaching methods, examinations and curriculum. Considering that physics is a requirement for many vocational and technical courses in university and other tertiary institutions, there in need to enhance students' achievement and motivation to learn the subject.

Hence, the urgent need for this study in order to fill the gap in the literature on instructional influences on the implementation of Physics curriculum for secondary schools in Kenya. Accordingly, there is need for the government to review the curriculum to meet the market needs.

2.5.1 Inquiry-Based Teaching (IBT) Methods

'Inquiry' refers to an intellectual process through which students develop understanding of science ideas and the ways in which scientists study the natural world through actively engaging with scientific questions and investigations (Zheng & Geelan, 2013). Inquiry-Based Teaching (IBT) approach is used to describe teaching strategies that are driven by scientific inquiry. The approach is deeply rooted in constructivism teaching practices. It is student-centered and offers students opportunities to be actively involved in experimenting, questioning and investigating. Inquiry-Based Teaching found its roots in United States of America (USA) and other western countries but today science curricula in developing countries has begun to devote attention to IBT (Zheng & Geelan, 2013).

China in her recent curriculum reforms advocated "a variety of other learning activities such as active participation, exchange and co-operation, exploration and discovery to enable the students to become independent learners", and stated that "learning science should be a hands-on experience, where the student actively deploys his scientific knowledge" (Zheng & Geelan, 2013).

The IBT approach has been considered as being capable of promoting motivation among secondary school students since it creates interest in the process of inquiring scientific knowledge and skills. Research findings indicate that IBT may be very effective in enhancing students' achievement and motivation to learn science as well as development of scientific process skills (Sola & Ojo, 2007).

Njoroge et al., (2014) conducted a study on, "Effect of Inquiry-Based Teaching (IBT) approach on secondary school student's achievement and motivation in physics in Nyeri County, Kenya. The findings strongly supported IBT approach asserting that:

> Students taught through the Inquiry-Based teaching approach attain higher scores in the tests than those taught through Regular Teaching Methods (RTM). Therefore, education authorities in Kenya should encourage Physics teachers to use this approach and teacher training institutions to make it part of their teacher training curriculum content (Njoroge et al., 2014 p.14).

High academic motivation has consistently been linked to increased level of students' academic achievement (Kushman, Sieber & Harold, 2000). Thus, the development of students' motivation in Kenyan secondary schools is a valuable objective for Physics teachers because of its' inherent importance in enhancing students' enrollment and academic achievement in the subject.

Bybee's 2002 (as cited in Liewellyn, 2005) that there are 5E learning cycle model is an Inquiry-Based Teaching approach model. The 5E learning cycle model sequences learning experiences so that students have the opportunity to construct their understanding of concept during the teaching and learning process. The model leads students through five phases of learning that are easily described using words that begin with the letter E: Engagement, Exploration, Explanation, Elaboration and Evaluation. Bybee's 5E learning cycle model is represented in Figure 2.2.

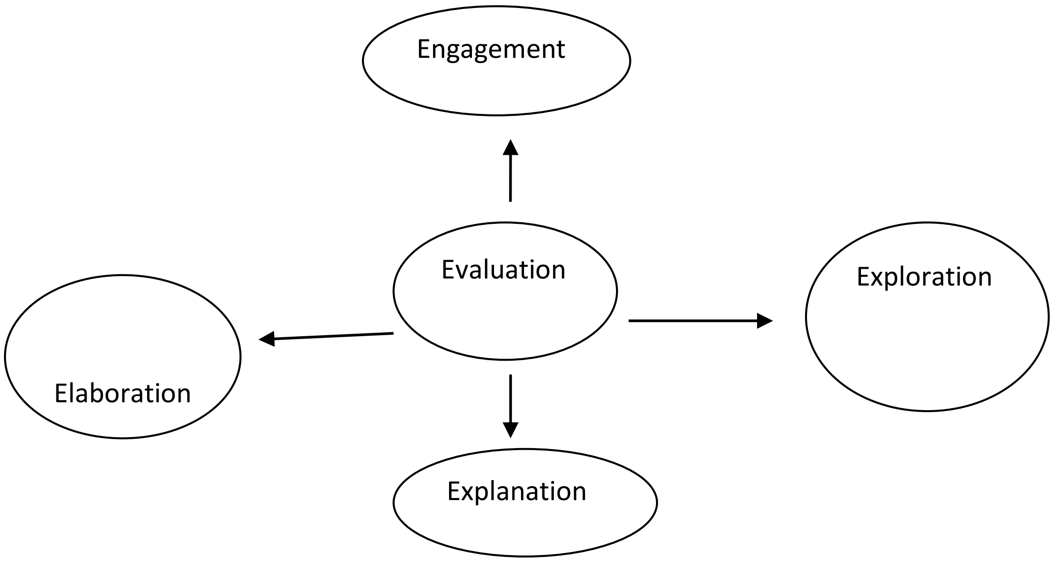

Figure 2.2: Bybee's 5E learning cycle model
Source: Adopted from Bybee's (2002)

Figure 2.2, shows the Bybee's 5E learning cycle model. In the engagement phase the teacher capture students' interest and makes them curious about the topic and concepts to be learnt. This phase provides an opportunity for the teacher to find out what students already know or think they know about the topic and concepts to be developed (Liewellyn, 2005). In the exploration phase students interact with materials and ideas through classroom and small group discussion. This helps the students to acquire a common set of experience so that they can compare results and ideas with their classmates.

In the explanation phase students are provided an opportunity to connect their prior experience with current learning and to make conceptual sense of the main ideas. This phase also provides the opportunity to apply introduced concepts to new experiences (ibid). This phase helps students to make conceptual connections between new and prior experiences, connect ideas and deepen their understanding concepts and processes.

In the evaluation phase is centrally placed in the model and takes place virtually in every phase of the 5E learning cycle model provides a summative assessment of what students know (Liewellyn, 2005).

Inquiry-Based Teaching method combined with Bybee's 5E learning cycle model may lead to deeper conceptual understanding and skill development which may enhance students' motivation to learn and achieve highly in the subject. According to Zheng and Geelan (2013), Inquiry-Based Teaching follows the following steps: (i) Identify scientific questions; (ii) design and conduct a scientific investigation; (iii) use appropriate tools to gather, analyze and interpret data; (iv) develop descriptions, predictions, models using evidence; (v) think critically and logically; (vi) consider alternative explanations; and (vii) communicate scientific procedures and results. The steps follow scientific processes which are clearly leads to self directed learning by students.

However, it was noted by Zhang, Meng, Gao, Li and Xin (2003) that many Chinese science teachers found it very challenging to implement IBT in their classrooms. Therefore, this study is set to investigate the influence of Inquiry-Based Teaching on physics curriculum implementation for secondary schools in Kenya.

2.5.2 Laboratory practical method

Practical method of teaching in secondary school physics takes the form of laboratory experiments, demonstrations, fieldwork and excursions (Kapting'ei & Rutto, 2014). Teacher innovations and creativity could also introduce novel models of practical investigation. The effectiveness of teaching physics should be judged by the kind of practical activities that teachers and students are engaged in (Amadalo et al., 2012). This idea is supported by Black 1993(as cited in Kapting'ei & Rutto, 2014) that:

> "Sciences (Physics inclusive) are practical subjects best learnt through experiments, observations, analysis and generalization of conclusions. Physics and other sciences to be understood better by all, there is need to emphasis its instruction in secondary schools through practical approach" (Kapting'ei and Rutto,p.13).

According to Kapting'ei and Rutto (2014), Practical work may be considered as engaging the learner in observing or manipulating real or virtual objects and materials. Appropriate practical work enhances pupil's experience, understanding, skills and enjoyment of science. Practical work induces scientific attitudes, develops problem solving skills and improve concept understanding (Amadalo et al., 2012). Kapting'ei and Rutto (2014) noted that practical work in Physics helps develop familiarity with apparatus, instruments and equipment.

Manipulation skills are acquired by the learners and expertise is developed for reading all manner of scale. The observations made and results obtained are used to gain understanding of Physics concepts. Science process skills, necessary for the world of work as systematically developed. Practical work creates motivation and interest for learning physics. Students tend to learn better in activity based courses where they can manipulate equipment and apparatus to gain insight in content.

Laboratory experiments are based on constructivist learning theory (Kaptinge'ei & Ruto, 2014). These theories explain knowledge as being purposeful hands-on materials instruction. An example of this learning theory is the Kurt lewin's (2001) laboratory training approach as cited by Kaptinge'i and Rutto (2014), as explained in the model in figure 2.3.

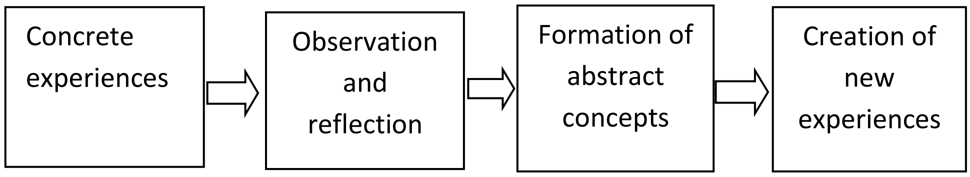

Figure 2.3: Kurt Lewin's (2001) laboratory training approach

In this model, knowledge construction is conceived as a four stage process. Concrete experiences is the first stage, it represents the immediate tangible experiences (hands on materials) that learners are involved in. During this process they physically manipulate apparatus like setting up a simple electric circuit. The second stage is observation and reflection, this stage basically entails the use of senses, which triggers sensory stimulus.

The stimulus triggered lead to the third stage, which is the formation of abstract concepts. It is the stage where stimulus is assimilated into the learner's mind as such concreteness turns out to abstractness. From the assimilation, new experiences and concepts are created leading to the fourth stage of creation of new experiences. These experiences generate new knowledge and represent the instructional objectives/expected learning outcome. The four stages are interlinked as one leads to the other. In Physics instruction ineffectiveness in practical instruction can be traced ultimately to lack of adequate linking within the four stages.

However, the reality on the ground is that most experiments are sterile, un-illuminating exercises whose purpose is often lost on the learners. Whatever goes on in the laboratory has little to do with actual students' learning science. Demonstrations are usually done by the teachers who also often miss the point of the demonstration. The science teachers in most Kenyan universities and teacher training colleges are mainly trained in theoretical content aspects. The consequence is that the physics teachers lack the skills for effectively guiding learners in conducting laboratory work.

In Kenya, science material innovations include; Physics micro-kits, specifically prepared by Science Equipment Production Unit (SEPU), as well as crude improvisation Ndirangu (2000) as cited by Amadalo et al., (2012). Of late, institutions are utilizing virtual laboratory that vary on the interplay of the computer and the internet.

This study acknowledges the great role that well planned and delivered practical work in Physics can play in influencing students' Physics learning in the Kenyan secondary schools. Therefore, deliberate effort has to be made to attract and retain the students into the Physics class by appealing to the curiosity raising element and discover component of practical work in the subject.

2.5.3 Project method of teaching

Project method of teaching is not new in the field of education (Murithi et al., 2013). It was introduced as a central part of progressive education movement and was used extensively in the British schools in the 1960s and 1970s (Katz, 1994). The method has since found its application in the study of science, which includes physics (Muriithi et al., 2013). Physics teachers use the project method as a means of teaching technical skills, problem-solving and use of tools as it provides a means for increasing student participation in the learning process (ibid). Project method is also referred to as Project-Based-Learning (PBL).

The employment of project method in Physics leads to paradigm shift in Physics curriculum implementation whereby teaching is moved from teacher dominance where the teacher was the centre of the learning process to learner-centered approach where the teacher's role is to guide and facilitate the learning process (Muriithi et al., 2013). Project is a problematic act carried to completion in its natural setting (Mwaka et al., 2014). Project work is used in instruction to expose learners to learning activities that enable them to apply knowledge acquired and create new knowledge. Through projects, students are engaged in innovation and creativity.

Project-based-learning involves assignments that call for students to produce something, such as a process or product design or device like electric motor (KIE, 2002). The culmination of the project is normally a written or oral report summarizing what was done and the outcomes (Wabugu & Changeiywo, 2008). Project-Based-Learning implementation in science curriculum has not been extensively reported (Muriithi et al., 2013).

Twoli and Maundu (1998) established that in Project-Based-Learning students mainly apply previously acquired knowledge and the final product is the central focus of the assignment. There are two types of projects used in classroom instruction namely; individual project; planned for each learner and the other type is group projects; planned for the whole class as a unit (Otunga et al., 2014).

Whether individual or group, project work follows specific steps in developing a project: Purposing, planning, execution, judging techniques, grouping and questioning. In practice, both the lecture and project method are used together and when used independently, they produce results that are almost similar (Muriithi et al., 2013). Studies comparing Project-Based-Learning to conventional instruction have yielded results similar to those obtained for Problem-Based-Learning including significant positive effects on problem-solving skills, conceptual understanding, and attitudes to learning and comparable or better learner achievement on tests of content knowledge (ibid).

Zhaoyao (2002) noted that project method is based on constructivist learning theory which contends that learning is deeper and more meaningful when students are involved in constructing their own knowledge. Therefore, this method arouses and maintains learner's interest, provides creativity, constructive thinking, developing team spirit and cooperation as some of the advantages (Mwaka et al., 2014). In addition this method helps the learner to develop capabilities faculty such as the intellectual skill, cognitive, faculty, motor skills and positive attitude towards physics. Project work also uses locally available materials which help in reducing learning cost (Muriithi et al., 2013).

This method has the following limitations: time consuming, allowing overlapping of subject matter and overdevelopment of individualism when individual project work is over used. In case of group project work students may also be less equipped to work independently. Over the years, enrollment in Physics and performance has been low and many reasons for this scenario have been postulated by educationists, chief among them being the methods and approaches used by the teachers. Project method as found out by Muriithi et al., (2013) has the potential of increasing enrollment and improving academic performance in physics.

However previous studies (eg., Andrews, 2006; Changeiywo, 2002; & Esokomi et al., 2016), addressing the challenges of teaching and learning physics in secondary schools in Kenya have focused on learning environment. Esokomi et al., (2016), for instance observed that:

> Students learn effectively through active learning methods such as project work, field trips and Science Club Activities. Esokomi et al., (2016) argues that in contrast to Okere (2000) who surveyed the status of physics teaching and examinations in Kenya secondary schools found out that teachers hardly use field trips and project work in teaching.
>
> The findings had revealed that teachers do not employ field trips strategy at all in their schools although many learning sites were available around the school (Esokomi et al., 2016, p.89).

2.5.4 Discovery experiment method

Learning that is meaningful to students is developed through discoveries that occur during exploration which is motivated by curiosity (Bruner, 1964). Albert Einstein observed that pure logical thinking cannot yield knowledge of empirical word (Tsuma, 1998). In fact all knowledge of reality starts from experience and ends in it.

The Discovery Experiments Method (DEM) of teaching is fashioned from the constructivist view where the learners construct and even creates knowledge. The learner then assimilates it with existing knowledge (Uside et al., 2013). The Nuffield science project of 1966 both in Kenya and Nigeria approach to learning which emphasized learning of sciences by discovery or the problem solving method did not succeed because most of the materials that were used were imported and were unsuitable for the Kenyan Curriculum (Momanyi et al., 2010). Given that science teachers are trained in improvisation, it is possible to use DEM to generate new knowledge.

The knowledge acquired by learners themselves from data is more likely to be flexible and transferable than knowledge acquired from experts and transmitted to the learners by an instructor or other delivery agents (Cushing, 1998). The discovery experiments method of learning provides learners with opportunity to firsthand experience with nature thus reinforce retention of knowledge and concepts learned. The DEM approach to learning exposes students to pleasant discomforts which promote learning and self actualization and hence provides positive reinforcement.

According to Okere (1996) teachers should maximize the degree to which learners expand their knowledge by developing and testing hypothesis rather than merely listening to verbal presentations of information. Therefore for effective learning to occur, emphasis is to be put on activities that encourage students to search, explore analyze or actively process input that merely respond to it. When this approach to teaching is practiced in physics, the learners' mind is opened to understand how the Physics principles and laws come about.

Failing during discovery learning is seen as a positive circumstance Bonwell (1998) as cited by Uside et al., (2013). Thomas Edison is one example of Physics learners who employed discovery learning by trying 1200 designs of light bulbs before finding one that works Love, 1996 as cited by Uside et al., (2013). He never got discouraged because he felt that he had learnt thousands of designs that do not work. Therefore, learning also occurs through failure, in line with many psychologists who showed that failure is part of the education process (Uside et al., 2013). Psychologists content that if a student does not fail while learning, the student probably has not learnt something new.

The DEM approach to learning exposes students to circumstances of failure hence learning through mistakes. Students exposed to DEM go through a natural progressive process which enhances learners' internalization of concepts (Papert, 2000). This makes learning more permanent as opposed to traditional methods of learning that are fact based which result in rote learning. Employers in the 21st Century are now interested more in employees with good problem solving techniques (KNBS, 2013).

Managers in huge business enterprises such as general motors, Microsoft cooperation and Safaricom look for employees who can easily adopt to change by requiring little training once they are hired. Graduates from schools are expected to collaborate, work in turns, teach others and negotiate (Rice & Wilson, 1997). In addition, the business world and the society expect graduates to acquire, interpret and evaluate data to learn reason and solve problems. It is possible to sharpen those skills by training students through discovery experiment method in Physics.

In this decade there has been little research that has been done to compare the DEM with traditional methods of teaching. The design of this study is to add on the available literature about influence of DEM on the implementation of the Physics curriculum in secondary schools in Bungoma County.

2.5.5 Mastery Learning Approach (MLA)

There are two types of motivation to learn: these are extrinsic and intrinsic motivation (Mwaka et al., 2014). Extrinsic motivation is directed at earning rewards that are external to learn, while intrinsic motivation is doing something because it is inherently interesting or enjoyable (Deci & Ryan, 1985). Most of the tasks found in Physics courses that students are required to perform are not inherently interesting or enjoyable. Therefore the need for teaching strategies that will promote students' motivation to learn Physics. Several early studies have shown that positive performance feedback enhances intrinsic motivation (Deci, 1971; Wambugu & changeiywo, 2008; & Changeiywo et al., 2010).

These studies strongly support Mastery Learning Approach (MLA) with the main reason being that this teaching approach provides continuous feedback to the performance of students. Hence motivating students to value and self-regulate the academic activities, carrying them out on their own. According to self-determination theory, this can be done by fostering internalization and integration of values and behavioral regulation (Deci & Ryan, 1985). Internalization is the process taking in a value or regulation and integration is the process by which individual more fully transform the regulation into their own so that it will emanate from their sense of self (Githua & Mwangi, 2003).

Mastery Learning Approach is an instructional method where students are allowed unlimited opportunities to demonstrate mastery of content taught (Wambugu & Changeiywo, 2008). MLA involves breaking down the subject matter to be learned into units of learning each with its own objectives. This strategy allows students to study materials unit after unit until they master it (Dembo, 1994). This approach emphasizes students' mastery of specific learning objectives and uses corrective instruction to achieve that goal.

Mastery Learning Approach works well particularly with hierarchically and sequentially ordered subjects (Changeiywo et al., 2010). Mastery of each content unit is shown when the students acquire the set pass mark of a diagnostic test. MLA helps students to acquire prerequisite skills to move to the next unit. The teacher is also required to do task analysis and state the objectives before designating the activities. MLA can help the teacher to know students area of weakness and correct it thus breaking the cycle of failure. Studies (eg., Dembo, 1994; Deci, 1971; Wambugu & Changeiywo, 2008 & Changeiywo et al ., 2010) have shown that MLA yields better retention and transfer of material, yields greater interest and more positive attitudes in various subjects than non-mastery learning approach.

Mastery Learning Approach has unique quality of enabling mastery of content by the students through supplementary instruction and corrective activities of small units of the subject matter. MLA also requires the teacher to do task analysis thereby becoming better prepared to teach the unit. The use of MLA in teaching Physics in secondary schools as confirmed by Changeiywo et al., (2010) helps to improve students' academic achievement. Mastery Learning Approach assumes that virtually all students can learn what is taught in school if their instruction is approached systematically and students are helped when and where they have learning difficulties (Bloom, 1984).

The most important feature of MLA is that it accommodates the natural diversity with any group of students, according to their levels of understanding. The goal of MLA is success for the student in achievement and motivation. In this method, the subject matter is divided into units that have pre-determined objectives or units expectations. Students must demonstrate on unit examinations, before moving to new content. Students who do not achieve mastery receive remediation through tutoring, peer monitoring, small group discussion or addition homework. The cycle of studying and testing continues until mastery is met.

Deci (1971) noted that minimal prior knowledge of material has higher achievement through MLA motivating students to learn than Regular Teaching Method (RTM). In RTM, the teacher aims at giving instruction on units of major topics in textbooks and then tests the students to determine how much knowledge they acquired (Dembo, 1994). In MLA, students are given specific feedback on their progress at regular interval throughout the instruction period.

This feedback helps them to identify what they have learnt well and what they haven't learnt. MLA tends to enhance student's cognitive and effective perspective for learning task and can build more interest towards learning Physics. This allows for relatedness in that the students feel respected and cared for by the teachers. Also through feedback, the students will more likely adopt and internalize the objectives since they understand it and have the relevant skills to succeed at it.

This method of teaching has not been tried in Physics teaching and learning in Bungoma County where performance in Physics has continued to decline. The available literature does not indicate any research on the influence of MLA on implementation of Physics curriculum in secondary schools in Bungoma County. This study will therefore fill the gap in the literature and body of knowledge on influence of MLA on the implementation of Physics curriculum in secondary schools in Bungoma County.

2.5.6 ICT integration method

To integrate means to plug in or to infuse (Mwaka et al., 2014). The emphasis here will be on the use of ICT to support or replace practical work as a vehicle for investigation and on the use of multimedia and the internet as a vehicle for the development of scientific reasoning. The integrated method enables learners to acquire knowledge, skills, and attitudes in different subjects/courses as they cover the selected content or theme. ICT integration in Physics curriculum implementation helps students acquire computer knowledge, skills and attitudes relevant in their daily life in the 21st Century (ibid).

Angela and Silvesta (2002) asserts that ICT integration in implementation of Physics curriculum has several merits: it assists teachers and pupils in achieving more effective learning, ICT also allows pupils to communicate more easily with research scientists through e-mail and on-line discussion groups. The World Wide Web (WWW) can also allow students to take part in scientific research projects, such as the pupil research initiative at Sheffield Hallow University (Miller, 2001). This should make science seen more real and proximate to pupils, rather than being a distant and separate area. It can also facilitate links being made between the science which is taught in schools, and the experiences of pupils in their everyday lives, thereby enriching their scientific understanding and experiences.

The use of applications, such as word processing, spread-sheets and databases within Physics teaching, can be powerful and has much in common with the enhancement afforded to learning in other contexts. Simulations and animations have been described as programs already supplied by the designers which might represent a natural process or a theoretical model aiming to explain and/or interpret a process (Angela & Silvesta, 2002). It is argued by Angela and Silvesta (2002) that emphasizing scientific knowledge is not enough for pupils to be scientifically literate. They need to be introduced to the ways that scientists come to these conclusions.

However, the way scientists come to conclusions is not entirely straightforward or uniform. According to Kola (2013), scientific methods as identified skills and practice (such as control of variables, testing hypothesis and data gathering), technologies and tools employed by scientists to gather valid and reliable data in order to verify, falsify or formulate a theory require ICT. These skills have always been important to an individual who wishes to play an active role in any development with a culture underpinned by science and technology.

Arguably in this era of information overload ICT tools are essential. ICT infrastructures are means of developing students' ability to be critically informed, users and producers of information in the case of science. ICT as a modern-heuristic method of teaching develops the skills needed to apply scientific reasoning skills for the analysis and critique of related information sources (Angela & Silvesta, 2002).

Kola (2013) laments that despite the great promises of ICT there are several factors hindering the integration of ICT in classroom. Factors influencing integration of ICT in secondary school classroom in Kenya discussed in this study are grouped as: curriculum factors, Physical & related factors and teacher factors. (a) Curriculum factor; ICT as a discrete subject, (b) Physical and other related external factors include; infrastructure, affordability of technology, Community facilities, School policy on ICT use and Socio-cultural and linguistic factor, economic and political factors, (C) Teacher factors influencing classroom ICT use.

Adeyemo (2010) examined Nigerian secondary school teachers' use of ICT in curriculum implementation and implications for further development using a census of 700 teachers. The finding showed that most teachers perceived ICT as very useful and as making teaching and learning easier. Further they argued that technology use creates a learner-centered environment by:

(a) Motivating learners by combining text, sound, colour and moving images that enhance content for easier learning;
(b) Facilitating acquisition of basic computer skills through drill and practice;

(c) Enhancing students ICT skills and communication hence improving access to reference materials from the internet and the quality of teaching.

According to UNESCO (2004), the three main approaches to ICT taken by teachers are: first, an integrated approach: Planning the use of ICT within the subject to enhance particular concepts and skills and improve students' attainment. Second, an enhancement approach: Planning the use of an ICT resource which will enhance the existing topic through some aspects of the lessons and tasks. Thirdly, a complementary approach: Using an ICT resource to empower the pupils' learning. ICT integration as a teaching method for implementation of curriculum has several potentials or benefits in physics and science education in general.

Kola (2013) contends that ICT bring together traditionally separated education technologies; books, telephone, television, photography, databases, games and more. In consequence, they bridge forms of knowledge and literacy, and they intersect. Kenyan ICT policies have been posing both opportunities and challenges to schools. To embed ICT in the educational infrastructure, teacher training, curriculum structures, materials, classroom practices and modes of assessment should be redesigned at all educational levels.

It was further noted by Kola (2013) that the drive for integrating ICT is that its use improves educational outcomes across the curriculum (Physics included) as revealed in examination grades and other standardized measures of assessment. It would be overly pessimistic to conclude that ICT has no benefit for education. Some positive findings exist, especially as regards improvements in student's motivation to learn besides improving learning outcomes (Passey, Rogers, Machell & Mchugh, 2004).

One benefit of ICT is that it enables self-paced (independent) learning when precisely in use (Selwyn, Potter & Cranmer, 2008). Livingston 2002 (as cited in Hennessy et al., 2010) asserts that the alternative proposition is that digital technologies can support a more flexible, learner-centered notion of education that facilitates the soft skills vital for the new demands of the 21st Century, global service and information economy. The potential of technology is that it may liberate teachers and students from the rigid hierarchies which have locked them to their desks, curricula and mobilizing multiple activities as mediators of learning. This is by not only reducing learning to reading and writing but also creating, designing, performing, and playing during learning process.

Moreover, ICT simulation software such as interactive physics, Modellus, Tina, Workbench, and many others promote learners interest to learn. According to Jimoyiannis et al., (2007) these simulations are applicable in teaching sciences. Simulations provide a wide range of affordances by supporting learning in science, enabling learners to perform at high cognitive levels and promoting conceptual change (Webb & Cox, 2004).

ICT integration can also help students' improve critical thinking. Jimoyiannis and Komis (2007) argued that teacher's who are positive to ICT integration, strongly support incorporating simulations into the existing curriculum with very little change in teaching pedagogical practices. Jimoyiannis and Komis (2007) contend that ICT integration can cause substantial changes in the education process and curriculum implementation (concerning the role of the school, the role of the teacher and textbooks, hence upgrading the role of the teachers). Considering the; speed and the ease of computation with spreadsheet applications such as Excel, manipulation of data accessible to learners. According to Ayiro (2015) digital recording media such as video cameras, sound recorder and data loggers have made data collection easier and more reliable.

Models to guide ICT integration in teaching include: First, as described by Heinich et al., (2001) the ASSURE model (Analyze learners; State objectives; Select media & materials; Utilize media & materials; require learner participation; Evaluate & revise). Secondly, the ICARE model (Introduce; Connect; Apply; Reflect; Extend) described by Hoffman & Ritchie (1998). Thirdly, the systematic planning model by Wang and Woo (2007a) and fourthly, the TPACK (Technological; Pedagogical; Content; Knowledge) model described by Mishra and Koehler (2006).

To effectively harness ICT for schools purposes requires sustained investment in supporting teachers training in order to create new learning environment (Jimoyiannis & Komis, 2007). Teachers play a critical role in implementation and use of ICT as they are at the centre of curriculum implementation and innovation at school level. However, many schools face a challenge of shortage of ICT skilled teachers and other IT professional that can support adoption and its use in classroom.

A survey by Laaria (2013) on skills, challenges in adoption and use of ICT integration and use in Kenya secondary schools showed that, of 2250 ICT teachers that graduated from universities and tertiary institutions in the year 2010, 1350 (60%) were absorbed in industrial or ICT service sector and 900 (40%) went to teach ICT in various educational institutions. Of those in teaching service, 189 were in technical institutions and 711 were in secondary schools. This displays a relatively small number of qualified ICT teachers in Kenyan schools.

A report by the MOEST (Government of Kenya, 2010) on secondary school teachers' adoption and use of ICT also indicated that the number of teachers skilled in ICT in secondary schools was low. The study revealed that out of the number available, few had ICT training effective in adoption and use of the technology in classroom. Out of the 232 teachers in the sample by MOEST, majority (57%) were reported to have trained at certificate level on basic computer skills, 73% were reported to have acquired ICT training through in-service courses and 43% were trained by private computer colleges.

Another study by Ayere, Odera, Agak (2010) on e-learning in secondary schools in Kenya, reported that a number of teachers in schools had not received any training in ICT use during their formative years at teacher training institutions before joining the profession. 55% of the sampled teachers reported having not received any ICT training at all. However, the study had reported that 51% of the teachers had taken self-initiative to undertake ICT training during the last three years they had been employed.

Successfully integrate ICT in classroom in secondary schools depends strongly on teachers' training on technology. Drent & meelissen (2008) observed that the level and quality of teachers training has a positive influence on how effective ICT is integration in classroom for curriculum implementation. Hence, training in ICT is an important factor influencing ICT integration in the classroom which may in turn influence implementation of Physics curriculum in secondary schools in Bungoma County.

However, UNESCO (2004) points out that most schools in Kenya have inadequate ICT facilities. This idea is supported by Syomwene (2013) who noted that:

> Few schools and colleges have access to computers, the internet and email facilities which are essential for research and learning process. Most schools in Kenya also lack chalk boards and visual aids. The fore going discussion indicate that lack of facilities in schools in Kenya is a major problem affecting teachers in implementation of educational reforms and policies in Kenya (Syomwene, 2013, p.83).

This study therefore endeavored to investigate the influence of ICT integration as a teaching method on the implementation of the Physics curriculum in secondary schools in Bungoma County.

2.6 Influence of Learners' Motivation on the Implementation of Physics Curriculum in Secondary Schools

The declining interest to study science on one hand and the lack of enthusiasm to take Physics in secondary school or avoiding Physics as a college major, on the other has been an international problem (Semela, 2010). The declining in enrollment and graduation rate in Physics at all levels has been the case in many countries including the USA, UK, Germany, and the Netherlands (ibid). Existing literature shows that the erosion of interest in the subject, emerge as early as lower high school to later result in compromising college enrollment.

In this regard, a number of factors have been identified to underpin the low interest to study science in general and Physics in particular. Learners' motivation is an important factor determining choice of Physics and achievement in the subject at secondary school level (Semela, 2010; Feyera, 2014; Momanyi et al., 2010; Tsegay & Ashraf, 2015).

Tsegay and Ashraf (2015) explained that there are two types of motivation; extrinsic and intrinsic motivation. Extrinsic motivation is directed at earning rewards that are external to a learner while intrinsic motivation is as a result of inherently interest or enjoyment. Tsegay and Ashraf (2015) opined that students' motivation tends to be stronger, more resilient, and more easily sustained when it emerges from internally held goals rather than externally applied coercion.

Motivation makes learners to like the subject; build competence and confidence in their abilities hence greatly predict students' achievement. This in turn improves the performance in the subject. Motivation to learn influences the decision making processes, determining the direction, focus, and level of efforts individuals apply to a learning activity.

Tsegay and Ashraf (2015) stated that a teacher is one of the five key factors that influence leaner's motivation. Other factors include a student, content to be learned, methods of teaching-learning and the learning environment. The teacher the greatest factor on learners' motivation since the teacher influences the other four factors. Recognizing the far reaching challenges of low learners' motivation towards Physics, attempts have been made to bolster students' motivation to study physics. These, among others, include introducing "innovative" physics curriculum (KIE, 2002; SMASSE, 2005).

Enrolment in Physics courses at all levels is low in many African countries. Reasons for this low enrollment range from; inadequate preparation, weak Mathematics background, lack of job opportunity outside teaching profession, inadequate teacher qualification as well as possession of below standard by teachers (Semela, 2010). Enrolment in Physics as a subject has also been an issue of concern to researchers in Physics education. In Kenya, few students choose to pursue the subject during the last two years of secondary school (Wambugu & Changeiywo, 2008).

The low enrollment in Physics in upper secondary school has been linked to low motivation and shortages of inspirational and well trained Physics teachers, inadequate laboratory facilities and the limited exposure to practical experiments (Amadalo et al., 2012). The means of candidates who enrolled in physics KCSE in the three categories of schools during the five years in Western province are shown in Table 2.5.

Table 2.5. Students' Enrolment Mean in Physics in secondary schools in Western province from 2005 to 2009

Year	Enrolment Mean of Different School Category			
	Boys Boarding	Girls Boarding	Co-education	Total
2005	97.88	46.50	15.13	159.51
2006	95.50	48.25	11.50	155.25
2007	102.25	52.63	13.94	168.82
2008	122.25	58.75	13.69	194.69
2009	131.00	52.88	16.31	199.19
Average	109.78	51.60	14.11	175.49
Percentage (%)	**62.56**	**29.40**	**8.04**	**100.00**

Source: Provincial Director of Education [PDE] Western province (2010)

As observed from Table 2.5, the present study is alarmed by trends that are posing serious challenges to the future of Physics education, basing on the fact that increased importance has been placed to the study of science and technology globally. As a subject, the way Physics appears to girls in co-education setting seems to be often gender stereotyped. Recent studies by Njoroge et al., (2014) and Kapting'ei & Rutto (2014) indicated that the quality of science education has been seriously compromised.

The competence of the Physics graduates and the students vanishing motivation and enthusiasm to study Physics is a source of concern not only to the institutions but also to the nation like Kenya. Kenya aspires to accumulate competent human capital in science and technology. Clearly, every effort should be made to create interest in the students to study Physics.

Physics like any other science subject is compulsory in the secondary curriculum in Form One and Two but majority of the students do not select physics in Form Three and Four (KNEC, 2015). Majority of the students consider the concepts involved as too abstract to understand and content taught too difficult to be learned (Changeiywo et al., 2010). Available literature shows that majority of the students in Kenyan secondary schools have inadequate knowledge and understanding of Physics concepts and principles (SMASSE, 2001).

Some specific topics in Physics have been identified by teachers and students as challenging for teachers to teach or difficult for students to learn (Changeiywo et al., 2010). Such topics like Magnetic effect of an electric current, reflection at curved surfaces, waves and fluid flow in the Kenyan secondary physics curriculum have been named as challenging to teach and difficult to learn by students (SMASSE, 2005). It was also reported by KNEC 2006 as cited by Changeiywo et al., (2010) that candidates have been performing dismally on questions in these topics.

Quality and quantity of teaching staff to meet the expectations of students and the society is another impediment to curriculum implementation. Teacher quality is measured by teacher qualifications, experience and mastery of instructional methods (Otunga et al., 2011). Teachers are the most important human resource in curriculum implementation since they are the ones who adopt and implement the ideas and aspirations of designers. These imply that success in curriculum implementation depends on the teacher and motivating influence to the learner (Changeiywo et al., 2010). A sufficient supply of trained teachers is therefore needed if the implementation of the curriculum is to be effective.

However, in Kenya schools have been experiencing teacher shortage for a long time. Teacher shortage has been estimated at 80,000 for both primary and secondary schools (Ayiro, 2015). In some secondary schools, classes are as large as 65 students instead of the expected 45 students per class. In other cases, untrained teachers are involved in teaching when the school does not have enough teachers; the few that are there are overstretched and overloaded, hence they are overworked which in turn affects their capacity to teach effectively.

In some cases secondary schools, where there is specialization in teams of teaching subjects; some subjects are not offered at Form three and four in certain schools even though they appear in the curriculum (Physics being a typical example) because of lack of trained teachers in those subjects. Ayiro (2015) asserted that: "The quality of education of a country largely depends on the quality of teachers". In other words, the quality of education is as good as the quality of teachers. If the quality of teachers is poor, the quality of education will be poor. What this means, therefore is that the quality of teachers determine the effectiveness in implementation of curriculum.

According to Sadie (2011), education system needs adequately trained and motivated teachers in order to succeed in curriculum implementation, but Kenyan education system lacks such teachers. In other instances, some teachers fail to perform effectively despite of their being fully qualified because they are either not well-trained or they are well-trained but demoralized by lack of teaching and learning resources or poor payment. While the ill- trained teachers lack subject matter, the well trained teachers fail to implement the curriculum effectively out of frustration because s/he has not been given the material resources needed for professional discharge.

Available literature shows that student-centered approaches motivate learners, which lead to an increase in enrollment and reduce gender gap. This is capable of promoting these attributes as observed by Osamah (2008); Kola (2013); Btissam and Nadia (2014). Hence, the urgent need for this study on instructional influences on the implementation of Physics curriculum in secondary schools.

2.7 Influence of Teaching-Learning Materials on the Implementation of Physics Curriculum in Secondary Schools

Curriculum implementation according to Mkandawire (2010) "is a network of varying activities involved in translating curriculum design objectives into classroom activities and changing people's attitudes to accept and participate in these activities" However, curriculum implementers (teachers, head teachers, standard officers and others) are faced with barriers which hinder the success of implementation of curriculum. It is very difficult to implement a curriculum successfully if the education system has limited funding capacities.

Limited funding raises a lot of other implications on the part of curriculum implementation (Otunga et al., 2011). The economy of a nation will determine the success of curriculum implementation. In developing countries; the number of pupils and teachers have kept on rising but government money available for Education is less (Sadie, 2011). Since manpower in the education sector has increased, the bulk of money allocated to education is absorbed by salaries leaving very little for buying teaching-learning materials like; books, in-service training, monitoring and other things needed for the smooth implementation of curriculum.

In the absence of teaching and learning materials, the teaching-learning processes will be hampered and if standard officers do not go out to evaluate, it will be difficult to know whether the curriculum is being effectively implemented or not (Mkandawire, 2010). Although the government of Kenya meets tuition costs for secondary schools to cushion the dwindling resources, the move has had little impact as most learning institutions are still experiencing liquidity problems. This has a negative effect on curriculum implementation.

Unavailability of school facilities and equipments like classrooms, libraries, resource centers, offices, desks, school halls and others. The fact that education is under-funded by the government means that the availability and quality of facilities in learning institutions is affected negatively. It has been observed that in most government schools in Kenya with an exception of the newly build infrastructure is still in a deplorable condition.

Despite the establishment of Constituency Development Fund (CDF) almost a decade ago to support poor schools and parents, the funds are distributed basing on political alignments. Much of the money has also been lost through corruption. In some certain instances, some schools have inadequate classroom accommodation due to population growth and increase in school enrolment due to free tuition. These deny eligible school children an opportunity to learn hence reducing effectiveness in curriculum implementation.

Mkandawire (2010) lamented that inadequate supply of teaching and learning materials and equipments are also a big challenge to effective curriculum implementation. Kenyan secondary schools face limited teaching-learning materials like books, chalk, science apparatus, inadequate or out-of date libraries; offer a big challenge to curriculum implementers (teachers). Worse still, with the high population growth rate, classrooms are overcrowded and learners are made to share limited materials like desks, books and laboratory apparatus in groups instead of individual learning as expected (ibid).

In such situations, teacher effectiveness is hampered and it becomes almost impossible for the teacher to render individual pupil attention because of large number of pupils in Physics classes particularly at Form One and Two. This kind of situation in institutions of learning makes it very difficult for curriculum implementers to carry out the role of teaching effectively.

There have been several studies done on instructional materials and academic achievement in Physics in secondary schools. Isola (2010) conducted a research on the effect of instructional resources on students' academic performance in West African School Certificate Examinations (WASCE) in Kwara state, Nigeria. The material resources were correlated with academic achievements of students in ten subjects; Physics included. The achievements of students in WESCE for a period of five years were related to the resources available for the teaching and learning process.

According to Isola (2010) instructional materials have a significant effect on students' achievement in all subjects. Isola (2010) found out that students in schools with adequate instructional materials out performed those with inadequate instructional materials.

Komakech and Osuu (2014) studied the impact and challenges in implementation of the Secondary Science and Mathematics (SESEMAT) programme in Uganda. The SESEMAT project was introduced in Uganda in 2005 with the purpose of improving the teaching ability of science and mathematics teachers at secondary school level. This programme was a joint venture between the Ugandan government and Japan International Cooperation Agency (JACA). It is mainly involved in In-Service Training (INSET) of serving teachers of mathematics and sciences.

According to komakech and Osuu (2014) Teaching of sciences has the following challenges; inadequate provision of relevant instructional materials which militates against effective teaching and learning. Komakech and Osuu (2014) submitted that; despite Africans' wealth, her education institutions still suffer from inadequate teaching aids.

Etenesh (2014) evaluated the challenges of Strengthening Mathematics and Science in Education in Ethiopia (SMASEE) in-service educational and training is an educational initiative launched on pilot basis in 2011with the agreement between the government of Ethiopia and Japan through the support of JICA. The objective of the programme was to improve students' performance in mathematics and science subjects in response to school failure to adequately provide the needed skilled human resources for the scientific and technological development. These are programs similar to the SMASSE project in Kenya with the same purpose of addressing poor performance and low enrollment in science subjects.

Experience over the years had shown that teachers depended on excessive use of words to express, to convey ideas or facts in the teaching-learning process due to inadequate instructional materials. This practice is termed as the, "chalk-talk" method. Today, advances in technology have made it possible to produce materials and devices that could be used to minimize the teachers talking and at the same time, make the message clearer, more interesting and easier for the learner to assimilate

(Onasanya & Omosewo, 2011). SMASSE (1998) proposed improvisation as a way of managing limited learning materials and low motivation in science subjects in secondary schools in Kenya.

However there are two main constraints militating against the successful improvisation of science equipment. These are the technical and the human factors respectively. While the technical factors relate to the question of degree of accuracy and precision that is possible with the improvised equipment, the human factor relate to the teachers' skill in developing the resources while providing the appropriate learning experience to the learners (Isola, 2010; Oladejo et al., 2011) also reported lack of adequate professional training as major problem militating against the effective use of local resources for science teaching. Isola (2010) stressed the need for a definite well planned training programme of improvisation for teachers. He suggested regular meaningful workshops on improvisation technique for science teachers to improve and update their competence.

Improvisation is seen as a way of using local materials which arouses students' motivation to learn Physics thus promoting implementation of Physics curriculum in secondary schools. However, it has been found out that in most of the developing countries (Kenya included) many teachers do not engage their learners in laboratory activities due to inadequate laboratory materials (Suleiman, 2013). The use of locally available materials in teaching and learning Physics has been increasingly popular due to inadequate funds allocation to public schools.

Therefore, improvisation has been suggested to provide teaching materials from one's locality when there is a shortage or lack of the standard ones (Mboto & Udo, 2011). Thus, in order to provide effective teaching and learning experiences, improvising which is the use of locally available material may enable learners to achieve desired scientific results in classroom.

In teaching and learning science under limited resources, SMASSE insists that everything required in teaching modern science materials are available in the local environment (SMASSE, 2005). This idea is supported by Thomas and Israel, 2012 (as cited in Suleiman, 2013) that:

> It is not an excuse for any science teachers to hide under inadequate laboratory equipments for not conducting practical activities for their students, this is because even Isaac Newton, Pythagoras, Galilee Galileo and the rest of the pioneers in sciences started building from themselves objects from around them to explain scientific concepts that are still relevant till these day (Suleiman, 2013,p.11).

This study therefore endeavored to investigate the influence of teaching-learning materials on the implementation of Physics curriculum in secondary schools in Bungoma County.

2.8 Influence of Teaching-Learning Activities on the Implementation of Physics Curriculum In Secondary Schools

The most important focus of science education is to prepare students to acquire scientific knowledge that they will apply in everyday life (UNESCO, 2010). This implies that science teaching ought not just to convey collection of facts to the students but also a way to think about the world outside the classroom. Therefore, teaching science has to be concerned with developing analytical, critical observation and problem solving abilities as well the creativity of an individual (Orhan, 2009). These abilities are less developed through traditional approaches to teaching because in traditional approaches, hands-on activities have no place to play. In the traditional approaches, learning is focused on mastery of content knowledge with less emphasis on the development of skills and the nurturing of inquiring attitudes (Suleiman, 2013).

To promote deep understanding of scientific concepts and positive attitudes towards science, it is recommended that science teaching and learning should be focused on the use of scientific activities to investigate real-life phenomena (Hofstein & Mamlok, 2007; Tobin, 2008; Suleiman, 2013; Esokomi et al., 2016). Physics is an experimental subject, thus teaching and learning becomes more effective when students are given opportunity to develop their own idea through science learning activities. The primary aim of providing science learning activities in secondary schools curriculum in Kenya is to motivate students and promote the value of Physics in the society (KIE, 2002).

Literature indicates a positive correlation between students' achievement and engagement in non-formal learning activities of fieldwork, science trips and science competitions. The American Institutes for research (2005) studied the effect of outdoor education on the youth in Califonia and found out a positive effect. The study involved 225 students who indicated an average 27 percent gain in post test scores above the pre test in the experiment.

A study by Andrews (2006) on effect of fieldwork on students' achievement and motivation in science education found out that students experienced a significant seven percent increase in achievement from pretest to post test results. Fieldwork increases students' achievements in the real natural world (Esokomi et al., 2016).

According to Orhan (2009), active learning through which students become active participants in the learning process, is an important means for development of student skills, in the process of active learning, students move from being passive recipients of knowledge to being participants in activities that encompass analysis, synthesis and evaluation besides developing skills, values and attitudes. Therefore, active learning is generally defined as any instructional method that engages students in the learning process.

In active Physics learning, the first factor to be considered is the activities to be carried out. The learning activities include; discussions, student presentations, games, role-playing, flip charts and handouts are employed. The basic elements of active learning are speaking, listening, reading, writing and reflecting. These five elements involve cognitive activities that allow students clarify the question, consolidation and appreciate the new knowledge. The second factor of active learning are strategies that incorporate the above elements include; small group co-operative work, case studies, simulation, discussion, problem solving and practical report writing. The third factor of active learning is the teaching resources that the teacher uses to encourage students to interact and participate actively in the learning activities.

In summary, active learning requires students to do meaningful learning activities and think about what they are doing. While this could include traditional activities such as homework, in practice active learning refers to activities such as (demonstration, group working etc), that are introduced into the classroom. An active learning environment requires students and teachers to undertake to a dynamic partnership in which they share the responsibility for instruction. Egunza (2014) argues that learners' retain knowledge depending on the activities/senses involved as shown in Table 2.6.

Table 2.6: Learning activities against percentage (%) retention

Activities	Percentage (%) retention
Hearing only	20
Seeing only	30
Hearing and visual support	50
Hearing, seeing and talk	70
Hearing, seeing, talking and doing	90

Source: Egunza (2014)

Table 2.6, indicates that when most of the senses are involved (hearing, sight and touch) learning is more effective at 90%. The data shows that retention is directly proportional to the number of senses involved in learning activities.

Orhan (2009) observed that active learning has several benefits which include; developing students' communication and problem-solving skills as well as their critical-thinking. Moreover, active learning increases students' interest and learning of students. Overall, active learning positively affect students' attitudes and academic performance in the subject. This idea is strongly supported by Esokomi et al., (2016) contended that:

> Science Club Activities (SCA) effectively and supplement conventional teaching methods of teaching physics in secondary schools. The results showed that participants of the SCA slightly outperformed non-participants of Physics Achievement Test (PAT). The efficacy of SCA can be attributed to the fact they encouraged direct interaction between students on concepts of interest and hence allow multiple approaches to learning.
>
> The learning emanates from discussion, research, presentations and open inquiry which are practiced by learners and are active methods or child-centered approaches to learning. Science Club Activities also provided learners with room of interpersonal communication and collaboration skills as they are exposed to team-based problem solving; especially when working on science congress projects (Esokomi et al., 2016, p.92-93).

Therefore, it is possible to make clear the physics concepts through active learning by giving students responsibility and helping them to develop their creativeness. This can be accomplished through activities learning method. However, the available research literature does not give enough information on active learning activities for physics teaching. For this reason, it is necessary to investigate the influence of learning activities on implementation of Physics curriculum for secondary schools. In Kenya, a number of studies carried out on learning activities are not sufficient to determine if they influence curriculum implementation positively or negatively.

2.9. Influence of Scope and Coverage of the Syllabus on the Implementation of Physics Curriculum in Secondary Schools

Poor time management by school administrators and teachers is another factor posing a challenge to the implementation of curriculum (Sadie, 2011). Curriculum implementation is also hindered by what goes on in schools. Students' learning time is mismanaged by administrators and the class teachers for instance in most schools, a lot of time is taken up by activities such as assemblies, games activities, meetings held by visiting government officials, health talks, variety shows held during lesson time, teacher in-service programs such as; Head of Department (HOD) workshops, subject workshops organized by Sub-County, and County Education offices.

Such workshops last the whole day and learners are either sent away or asked to stay away from schools, unplanned holidays such as when a teacher dies, public holidays and many other unforeseen eventualities take place at the expense of learners. On classroom time management; the class teacher is the main player. A teacher who is not conscious is not disciplined and a drawback in as far as curriculum implementation is concerned. For instance, a teacher of Physics who goes to class five

(5) minutes late for each lesson in a particular class every day, will have lost 25 minutes at the end of the week. This is a lot of learning time wasted and will delay syllabus coverage and implementation of the curriculum since curriculum developers do not take this time into consideration when developing the curriculum.

Teacher absenteeism from schools for various reasons also costs the students by depriving the learner of valuable time. In addition, the need to devote inordinate amount of time to the management of problems of large classes effectively reduce students' time on the learning task which results in the failure to complete the intended content for the lesson and will necessitate the allocation of more time to the same task (Mkandawire, 2010). Internal examinations, Mocks and final examinations also take up learning time for non examination classes.

The scope of the syllabus should be proportional to the allocated time for effective implementation (World Bank, 2008). The matter of instructional time in Sub-Saharan Africa (SSA) deserves high attention. The length of instruction time is a matter of considerable significance and a strong indicator of students' access to learning opportunities. There is positive correlation between instructional time and students' achievements and appears to be even stronger in developing countries (ibid). Intended instructional time is not the same as the actual learning time.

Studies in developed countries reveal disparities between intended instructional time in the curriculum implementation, actual time allocated in schools and the time learners spend actually learning (time on task). The time spend in situations where students and learning materials are well matched; learning occurs in a fairly ideal fashion (academic learning time).

While the intended annual instructional time for Sub-Saharan Africa (SSA) at junior secondary level seem to be the highest in the world, the time-on task seem to be significantly reduced for a number of different reasons (World Bank, 2008). Such reasons like; low allocation of teachers' working-time, late coming of students or teachers, teacher and learner absenteeism for a variety of reasons, non-teaching, classroom shortages, lack of learning materials and extra-curricular activities (ibid). According to the World Bank (2008) most of the time is spent on administrative and non-administrative tasks by teachers. Teachers' workloads are also perceived to increase significantly due to the extra tasks outside classroom.

The 8-4-4 education system in the Kenyan curriculum has Physics as one of the three science subjects offered at the secondary school level. The physics syllabus is divided into four years of study; Form One, Two, Three, and Four (KIE, 2002). In the Form One Physics syllabus the topics include: introduction to Physics (4 lessons), measurements I (12 lessons), Forces (16 lessons), pressure (24 lessons), particulate nature of matter (12 lessons), thermal expansion (12 lessons), heat transfer (12 lessons), rectilinear propagation of light and reflection at plane surfaces (16 lessons), electrostatics I (12 lessons) and cells and simple circuits (12 lessons). The Form One syllabus in total has ten (10) topics with a varying number of lessons and each single lesson takes 40 minutes while a double lesson takes 80 minutes.

The form Two Physics Syllabus include topics like: magnetism (12 lessons), measurements II (16 lessons), turning effect of a force (10 lessons), equilibrium and centre of gravity (12 lessons), reflection at curved surfaces (16 lessons), magnetic effect of electric current (18 lessons), Hooke's law (8 lessons), waves I (14 lessons), sound (12 lessons) and fluid flow (14 lessons). The form two Syllabus has a total of ten (10) topics with a varying number of lessons. Since form One and form Two Physics is compulsory for all secondary students in Kenya a total of twenty (20) topics must be covered by all secondary students before they are allowed to select or drop the subject at form Three when the subject becomes optional (KIE, 2002).

At Form One and Two, four (4) lessons each of forty minute, making a total of 160 minutes per week (2hours and 40minutes) per week are taught. The scope of the physics syllabus is said to be overloaded given the time allocated in the syllabus for each topic (UNESCO, 2010). Topics like; introduction to physics is allocated only 4 lessons of 40 minutes while Hooke’s law is allocated 8 lessons; clearly this time doesn’t match the content in those topics. As a result students end up having a weak Physics foundation yet the foundation is critical for studying Physics at upper high school and even college or University (Semela, 2010).

The Form Three physics syllabus include the following topics: Linear motion (20 lessons), refraction of light (20 lessons), Newton’s laws of motion (15 lessons), work energy power and machines (20 lessons), current electricity (20 lessons), waves II (10 lessons), electrostatics II (15 lessons), heating effect of an electric current (10 lessons), Quantity of heat (20 lessons), and gas laws (15 lessons). At the form Three level, a total of ten (10) topics are to be covered but the number of lessons per topic are generally higher than at Form One and Two and in addition the number of lessons per week are five up from Four at Form One and Two, making a total of 200 minutes (3hours and 20minute) per week. The form Four Physics Syllabus include: thin lenses (20 lessons), uniform circular motion (10 lessons), floating and sinking (15 lessons), electromagnetic spectrum (15 lessons), electromagnetic induction (20 lessons), mains electricity (10 lessons), cathode rays and cathode ray tube (10 lessons), X-rays (8 lessons), photoelectric effect (15 lessons), radioactivity (15 lessons), and electronics (10 lessons).

At the form Four level a total of eleven (11) topics are to be covered by the learner in one year having a maximum of five (5) lessons of 40minute, making a total of 200 minutes (3hours and 20minutes) per week (KIE, 2002).The time allocated for most of the topics is less than the expected time in topics like; Waves II, circular motion, cathode rays and electronics.

It can be noted that the Physics Syllabus at secondary school level has a total of forty one (41) topics to be covered by the learner in a period of four years. Studies like; Mkandawire (2010) and World Bank (2008), have shown that an overloaded curriculum influence implementation of curriculum in science subjects. This is because Physics teachers in high school do not cover all important topics in Physics syllabus, ending up with a tendency to spend half of the instructional time on few topics to the exclusion of others (Semela, 2010).

Shikuku (2012) in the study on "Effect of syllabus coverage on secondary school students' performance in Mathematics in Kenya" established that this factor does not directly contribute to poor performance in mathematics. Instead, late or non-coverage of the mathematics syllabus contribute to poor performance. In the study Shikuku (2012), suggested that:

> "In an attempt to improve performance, some parents arrange and pay for extra tuition for their children, so that they cover all topics within the syllabus" (Shikuku, 2012, p.31).

The study indicated a positive relationship between syllabus coverage and students performance. In addition, it was also observed that; students' who cover the syllabus early in the year and spend more time on revision, have an even better mean score than those who cover the syllabus just before KCSE examinations. To cover the syllabus early in the year, both students and teachers have to put in extra time for which the parents pay handsomely (Shikuku, 2012). Some schools use team teaching to ensure all topics in the syllabus are understood by all students. They also ensure both teachers and students are present in school and actually attend lessons. Other schools expel slow learners, and have a minimum mark that a pupil must obtain at Kenya Certificate of Primary Education (KCPE) for admission in Form One class (Ibid).

The poor working conditions for the teacher poses another challenge (Mkandawire, 2010) to curriculum implementation. In the same vein, poor salaries, housing and general poor service also demoralize the teacher who may resort to go into private commercial enterprises to supplement meager salaries. In Kenya the education sector has had regular teachers' strikes due to poor remuneration (Ayiro, 2015). These strikes indicate that the level of motivation of Kenyan teachers is low, hence reducing effectiveness of curriculum implementation.

The teachers' strikes also reduce learning time hence hinder effective curriculum implementation in schools. If various educational policies and programs are to be effectively implemented, teachers ought to be adequately trained and motivated. After pre-service training which provides foundation for professional service, teachers need to keep a breast with new development in the system through in-service training (SMASSE, 1998). Other professional support staffs such as laboratory technicians and librarians also need to be in-serviced in order to give sound support to the teaching staff in the implementation of the curriculum.

This study therefore endeavored to investigate the influence of scope and coverage of syllabus on implementation of Physics curriculum in secondary schools with a view of making implementation of Physics curriculum in secondary schools effective.

2.10 Effective Implementation of Physics Curriculum in Secondary Schools

Darling-Hammond (2010) defined an effective teacher as one who is intellectually challenging, motivating students, setting high standards and encourages self-initiating learning. Aderson (2004) viewed effective teachers as those teachers who achieved the goals set for them. Effective teachers are very important for effective curriculum implementation. However, teachers' effectiveness is difficult to define since there has not been a consensus agreement on what measures quality teaching (Oluremi, 2013).

However, it is possible to measure teachers' attribute like interaction with students, teaching strategy, motivation, pedagogical content knowledge and classroom management through qualitative research approach (Aina et al., 2015). Oluremi (2013) identified four dimensions that could be used to characterize an effective teacher as follows: (a) Instructional effectiveness, (b) Uses of assessment for student learning, (c) Positive learning environment; and (d) Personal quality of the teacher.

The conceptualization of implementation of Physics curriculum as adopted from Aina et al., (2015) is shown in Figure 2.4.

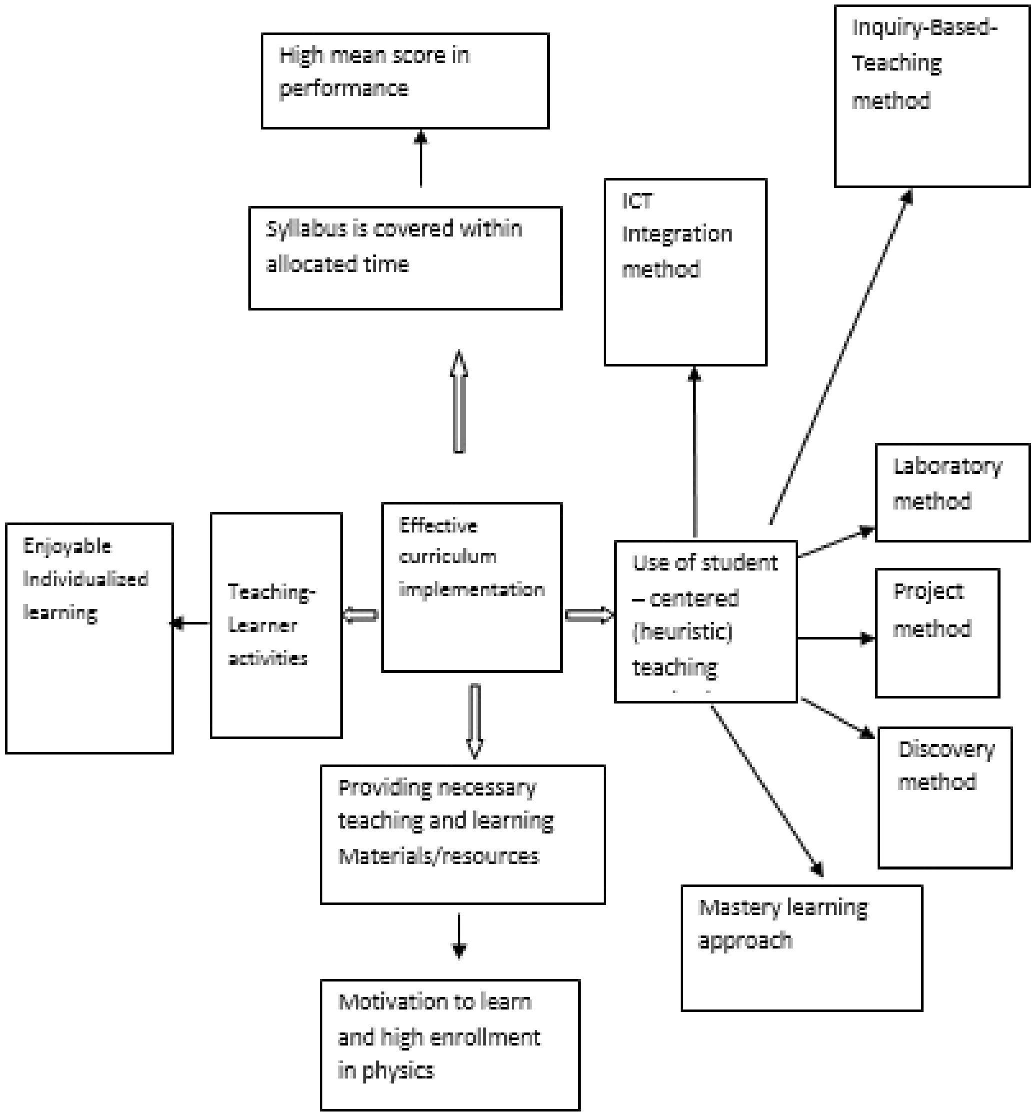

Figure 2.4: Conceptualization of effective implementation of Physics curriculum

Source: Adopted from Aina et al., (2015)

As shown on Figure 2.3, it can be conceptualized that teachers' effective curriculum implementation could be measured by his or her use of modern teaching methods; provision of teaching-learning materials; providing enough learners' activities which promote enjoyable individualized learning and covering the syllabus in the allocated time. Effective curriculum implementation should not only be concerned with students' academic goals but also concerned with learners' motivation and/or enrollment in the subject, practical skill acquisition and emotional enjoyment in the learning process. Since students enter into classroom from different backgrounds, an effective teacher should always maximize instruction time and make good use of it (Oluremi, 2013).

An effective teacher who effectively implementation curriculum is one that has high expectation in terms of learners' performance. A teacher who has low expectation for his or her students about learning is not effective. An effective teacher especially in Physics makes use of different modern teaching methods in classroom (Kola, 2013). The use of technologies is imperative for all effective teachers in schools today. Effective teachers also employ: Inquiry-Based-Teaching, laboratory, project, discovery and mastery learning methods in Physics classroom.

Syllabus coverage in the allocated time is critical for producing high mean scores in the subject. Assessment and feedback is very important to students learning since it improves their learning (Aina et al., 2015). Maintaining a positive environment is the responsibility of an effective teacher. An effective teacher will always interact with students both within and outside the classroom because this is very important to students' learning. This is because most students learn best in the environment where they are able to freely express their feeling and in a situation when they are free with the teacher.

Apart from these attributes, of teacher' effectiveness mentioned, others that are very important in measuring curriculum implementation effectiveness are motivation for both the learner and the teacher, content knowledge and students' homework (Kola, 2013). Teacher effectiveness in classroom is very important and where a teacher is not effective in teaching, students' academic performance (mean score) will be low.

The described poor performance in Physics in Kenya and in Bungoma County in particular may be due to ineffective curriculum implementation. Studies have shown that teacher-efficacy is important variable in teachers' effectiveness. Bandura (1997) believed that teachers who perceive themselves efficacious will spend most time on students' learning, support students in their goals and reinforce intrinsic motivation. The effect of teachers' effectiveness on student achievement is both additive and cumulative; teachers' effectiveness increase effective curriculum implementation hence, students' achievement (Aina et al., 2015).

According to Egunza (2014) teaching effectiveness directly depend on lesson planning effectiveness. In a study carried out on, "A Discussion on Teacher effectiveness in curriculum in Kenya with focus on Makadara Division." The study noted that:

> Planning effective lesson is an important step for a teacher. A lesson plan may be defined as a set of teaching-learning activities for pupils to be carried out within a defined time. A lesson plan usually covers a single or double lesson and the learning activities are arranged in a chronological pattern and defined by steps. A lesson plan should emphasize the importance of learning by doing and collaborative learning, these are: (a) lesson objectives, (b) teaching-learning resources and teaching aids, (c) methodology (teaching methods and skills, (d) lesson assessment and evaluation (Egunza, 2014, p.374).

This literature informs this study that effective implementation of curriculum begins with proper planning, setting the objectives to be achieved putting the available time into consideration , acquiring the materials to be used, arranging the teaching learning activities and how to evaluate the learning effectiveness. This study therefore endeavored to investigate the influence of scope and coverage of syllabus on implementation of physics curriculum.

2.11 Related Studies

This literature review borrowed much from experimental studies originating from Kenya, Nigeria, Uganda and Ethiopia to narrow to the African context and developing countries. Few studies reviewed originate from developed countries like USA, Britain and China. This study was concerned with missing knowledge and literature on; instructional influences on implementation of Physics curriculum for secondary schools in Kenya.

The influence of instructional factors on implementation of Physics curriculum is still in its early stages of development. However, initial research demonstrated a positive correlation between instructional influences and implementation of Physics curriculum (Mkandawire, 2010). The study of influence of various teaching method on students' academic achievement in Physics has received much attention during the past two decades. Changeiywo Johnson a foundational researcher in the field of Physics Education established that, teaching methods have a significant influence on students' motivation and achievement in Physics.

The various teaching methods focused on by different researchers include: Inquiry-Based Teaching by Njoroge et al., (2014), Laboratory practical by Kaptinge'ei & Rutto (2014), Project method by Muriithi et al., (2013), Discovery by Uside et al., (2013), Mastery Learning Approaches by Wambugu and Changeiywo (2008) and ICT integration by Kola (2013) are similar in that they are all student-centered and depend on school infrastructural and availability of teaching-learning materials to be effectively employed in curriculum implementation. It is also apparent that most of this studies adopted quasi experimental research design.

However, MLA studied by Wambugu and Changeiywo (2008), unlike the other methods emphasis content mastery as opposed to other methods which emphasis science practical skill acquisition. Such work has broadened the understanding of influence of teaching methods on students' academic achievement in Physics and has allowed for the further evolution of understandings devoted to the adaptation of different teaching approaches. Many researchers currently believe that teaching methods might serve as a means of addressing poor performance and low enrollment in Physics.

Semela (2010); Wambugu & Changeiywo (2008); and Amadalo et al., (2012) all agreed that the low enrollment in Physics is linked to low motivation and shortage of inspiration teaching but Semela argues that; the low motivation emerges earlier before senior high school. Studies by Isolo (2010), Onasanya & Omosewo (2011) all agreed on the importance of learning materials in implementation of Physics curriculum. Learning activities are also strongly supported by studies by Orhan (2009), Suleiman (2013) and Esokomi et al., (2016).

Much of the current researches on Physics Education are based on the theory of learning attributed to Jean piaget's work. Jean piaget (1967) in his constructivist theory of learning proposed that the "learning is more meaningful when students are involved in constructing their own knowledge" (Muriithi et al., 2013, p.3).

The study by World bank (2008), Mkandawire (2010) and Semela (2010) identifying: funding of education, staff training, teacher workload, school leadership as well as time allocation in the syllabus as some of the factors that are foreseen to influence curriculum implementation. There has been a great deal of controversy surrounding the implementation of curriculum in schools. One of the controversies has been that due to the large workload teachers have due to under staffing, teachers cannot effectively implement the curriculum (Ayiro, 2015). On the other hand the government has insisted that the failure to effectively implement the curriculum is due to teachers' laxity. However, current research is drawing powerful connections between instructional influences and implementation of Physics curriculum, which is creating a strong foundation for further acceptance of this field of study.

One of the strongest critiques argued that it is not the failure of Agriculture teacher to implement the curriculum but the failure of the government and school administrations to provide adequate materials. This argument is often used as foundation for the teachers unions to defend teachers against any blame by various education stakeholders (Cheplogoi, 2014). However Cheplogoi (2014) wrote:

> "Provision of adequate materials, facilities and equipments to Agriculture teachers by school administrations is crucial for effective implementation of the Agriculture curriculum" (Cheplogoi, 2014, p. 1062).

Cheplogoi's attempt was not to devalue effective implementation of curriculum. However, he did bring to light the importance of "instructional influences" that could also be attributed to effective curriculum implementation measured by improved performance. Other researchers have specifically included aspects of non-formal learning activities into their understandings of implementation of curriculum. For instance, Esokomi et al., (2016) in a study of 217 students and 60 secondary school teachers in Vihiga County Kenya established that a linkage existed between participants of Science Club Activities (SCA) and interest and performance in Physics. SCA was found to positively affect Physics performance.

As research in the field of Physics Education increased during the past decade, it became apparent that there were connections between instructional influences and implementation of curriculum. Furthermore, the understanding of the immediate learning environment beyond the traditional lecture environment. Building on Jean Piaget's (1967) original work on learning, researchers have explored reasons beyond cognitive ability of the learner to explain success in learning process. Deci (1971) described the effect of externally mediated rewards on intrinsic motivation; he discovered that reward and incentives offered will greatly affect learners' motivation.

Specific aspects of tests that focused on challenges of curriculum implementation in learning institutions led researchers to conclude that there was a direct positive correlation between instructional factors and implementation of curriculum. However, some critics continue to question the validity of the associate factors on the implementation of curriculum. Researchers have begun to answer such critiques by linking instructional factors and implementation of curriculum. This connection has yielded widely accepted methods for the testing and classification of instructional factors influencing implementation of the curriculum within the parameters of "scientific study" (Mkandawire, 2010).

2.12 Research Gap

The chapter has explored both historical and modern days literature related to implementation of the curriculum for Physics for secondary schools. The literature is related to teaching methods, learners' motivation, teaching-learning materials, teaching-learning activities and scope and coverage of the syllabus. In this chapter both online studies and book references are cited and they include: Andrews (2006) who studied effect of field work on students' academic achievement and motivation in

Science Education in Califonia in America while Muriithi et al., (2013) focused on project method and learning achievement in Physics.

Njoroge et al., (2014) studied the effect of Inquiry-Based Teaching Approach (IBT) on students’ achievement and motivation in Nyeri County Kenya same to Liewellyn (2005) who studied on teaching high school through Inquiry. Almost similar was a study by Uside et al., (2013) on effect of Discovery method on students’ achievement in Physics in Kenya. Wambugu and Changeiywo (2008) studied the effect of Mastery Learning approach (MLA) on students’ achievement in Physics.

A similar study by Changeiywo et al., (2010) investigated students’ motivation towards learning Physics through MLA. Kapting’ei and Rutto (2014) studied challenges facing laboratory practical approach in Physics instruction in Kenya. Otieno (2009) studied use of discussion method on students’ achievement.

Angela and Silvestra (2002), Ayere et al., (2010), Buabeng-Andoh (2012), Btissam and Nadia (2014), Heinich et al., (2001), Hennessy et al., (2010), Hirumi (2002), Hoffman and Ritchie (1998), Jimoyiannis and Komis (2007), Kagwiria (2013), Kola (2013), Laaria (2013), Miller (2001), Mishra and Koehler (2006), Passey et al., (2014), Selwyn (2008), Qiyun (2008), and wang and Woo (2007a) all these studies focused on ICT integration in teaching and learning to enhance learning in schools. All these studies are similar in that they all focused on a particular teaching method and how that method influences students’ achievement and motivation but none of the studies investigated influence of teaching method on the implementation of the curriculum for Physics.

Deci (1971) studied effects of externally mediated rewards on intrinsic motivation while Deci and Ryan (1985) studied on intrinsic motivation. Semela (2010) studied

Factors Influencing the Choice of Physics among Ethiopian University Students. None of the studies cited investigated influence of learners' motivation on implementation of curriculum.

Studies that investigated on improvisation include; Mboto and Udo (2011) who studied Effect of improvised materials on students' achievement and retention. Onasanya and Omosewo (2011) studied Effect of Improvised and standard Instruction Materials on students' performance in Physics. Thomas (2012) studied Improvisation of science equipment in Nigerian schools. But Suleiman (2013) studied Teachers' Experiences of teaching science with limited laboratory resources. Of all the cited studies none of the studied focused on influence of learning materials on the implementation of the curriculum for Physics for secondary schools.

Esokomi et al., (2016) is the only study that investigated on Influence of Science Club Activities on secondary students' interest and achievement in Physics in Vihiga County Kenya but the study did not focus on influence of learning activities on the implementation of the Physics curriculum in secondary schools.

Shikuku (2012) studied Effect of syllabus coverage on secondary school students' performance in mathematics in Kenya. This is the only study cited that investigated on syllabus coverage but did not focus on influence of scope and coverage of syllabus on implementation of the Physics curriculum.

Some citations in the literature studied on curriculum implementation and they including: Cheplogoi (2014) who studied challenges faced by teachers in implementing Agriculture curriculum in Baringo County in Kenya. Kyule, Ochieng and Nkurumwa (2016) studied challenges in implementation of secondary school

Agriculture curriculum in Kenyas' Arid and semi arid counties. These two studies focused on curriculum implementation but in Agriculture.

Other studies that investigated on curriculum implementation include: Mkandawire (2010) who studied challenges of curriculum implementation in learning institutions. Syomwene (2013) studied factors affecting Teachers' implementation of curriculum reforms and Educational policies in schools while CEMASTEA (2015) discussed effective coordination and supervision of quality curriculum implementation and learning outcomes. Egunza (2014) discussed teachers' effectiveness in curriculum in Kenya but Sadie (2011) studied on Implementation of new curriculum in Newzealand. These cited studies did not focus on instructional influences on the implementation of the Physics curriculum.

Amadalo et al., (2012) investigated effect of practical work in Physics on girls' performance in Kenya while Amunga et al.,(2011) studied disparities in Physics achievement and enrollment in Western province of Kenya. These two researches focused more on gender differences in learning Physics in Kenyan secondary schools.

Darling-Hammo (2010) evaluated teachers' effectiveness, similarly Oluremi (2013) studied education effectiveness in Nigeria. Changeiywo (2002) studied Problems hindering the effective teaching of science subject in Kenya schools.

Other studies like Feyera (2014), Forooq et al., (2011), Isolo (2010), Makgato and Andile (2006) studied Factors associated with high school learners' poor performance in Physics. Aina (2012) studied factors affecting students' performance in Sciences in Nigerian schools while Adeyemo (2010) had studied teaching and learning Physics in Nigerian schools. Woudo (2010) studied Factors affecting performance in Physics among learners with celebral palsy in KCSE. These studies generally investigated performance in Physics. Hence did not focus on instructional influences on the implementation of Physics curriculum.

Books cited in this study include; Essentials of instruction by Mwaka et al., (2014), Instructional Methods by Nasibi (2003), Instructional Methods in Education by Twoli et al., (2007), Teaching and Learning: A handbook by Tobin (2008), General instructional Methods by Mukwa and Too (2002) and A handbook for curriculum and instruction Otunga et al., (2011). All these books focused on general methods of teaching and none of the focused on instructional influences on the implementation of the Physics curriculum in secondary schools in Kenya.

This study therefore sought to fill the gap in the knowledge and literature on instructional influences on the implementation of Physics curriculum in secondary schools, in Bungoma County.

2.13. Chapter Summary

This chapter has shed light on the historical background of Physics Education, role of secondary Education in society, Physics in the Kenyan school curriculum, academic achievement in Physics in secondary schools, influence of: teaching methods; learners' motivation, teaching-learning materials; teaching-learning activities; and scope and coverage of syllabus on implementation of Physics curriculum in secondary schools. The chapter further sheds light on effective implementation of the Physics curriculum, related studies and research gap and finally the chapter summary. Having reviewed the literature, the next chapter provides details of the design and methodology to be applied in sourcing, processing and analyzing the requisite data.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.0 Introduction

In this chapter, the research design and methods are discussed. The chapter discusses research paradigm, methods, research design, research area, target population, sample size and sampling procedure, research instruments, ethical issues, validity and reliability, data collection procedures, pilot study, data analysis, and summary of research design and methodology.

3.1 Research Paradigm

A paradigm is a set of common beliefs and agreements shared between researchers about how problems should be understood and addressed (Creswell, 2009). Bryman (2004) gave a broad view of paradigm by defining it as a systematic way of thinking about the word, about knowledge, and by extension about doing research. Accordingly a paradigm is an organization framework that contains the concepts, theories, assumptions, belief, values, and principles that inform a discipline on how to interpret subject matter of concern (Mitchell & Jolley, 2007).

This study draws on pragmatism research paradigm. Pragmatism world view is about mixed methods tenets of research that allows the combination or associates of both qualitative and quantitative forms in tandem or concurrent so that the overall strength of the study is greater than either qualitative or quantitative (Bergman, 2008). It involves mixing both quantitative and qualitative methods in a single study to understand a research problem. This paradigm emerged as a result of debates discussing the advantages and disadvantages of quantitative verses qualitative research as a result of the paradigm “wars” (Creswell & Plano, 2011). Morgan (2007) contributes to the point-of-view that the researcher should not be confined to one type of research, but should shift from one paradigm to another depending on the purpose of the research. Individual researchers have a freedom of choice. As opposed to positivism and constructivism, pragmatisms argue against a false dichotomy between the qualitative and quantitative research paradigms and advocate for the efficient use of both approaches. They are “free” to choose the methods, techniques, and procedures of research that best meet their needs and purpose (Teddlie & Tashakkori, 2003). Pragmatism paradigm was therefore the most appropriate choice for this study.

In this study the researcher sought to investigate instructional influences on the implementation of Physics curriculum in secondary schools in Bungoma County. The data collected in order to answer the research questions effectively about teaching methods, learners’ motivation, teaching-learning materials, teaching-learning activities and scope of the syllabus was both qualitative and quantitative data. This was because the research questions in this study do not suggest clearly that either a positivist or constructivism philosophy could work in isolation (Morgan, 2007).

In adopting pragmatism paradigm the researcher tried to avoid what may be characterized as methodological monism; the insistence of using a single research method. Neither was it due to an inability to decide between the merits and demerits of various alternatives but rather that all methods are valuable if used appropriately and that research can include all elements of both the positivist and constructivism approaches if managed carefully. Creswell and Plano (2007, p.27), observed that researchers do not have to “be the prisoner of a particular research method or technique”. Educational research method is not of extreme importance to the advancement not only of education but all theoretical and practical sciences.

Identifying a research problem, describing the problem, choosing the method of collecting data, analyzing and interpreting data are all essential processes in achieving the whole (Power & Knapp, 1990).

3.2 Methods

Methods' are ways to systematically solving the research problem (Kothari, 2009). It may be understood as a science of studying how research is done scientifically. I According to Silverman (2003) research methods inform the assumptions underlying various techniques adopted in the study and criteria by which certain techniques and procedures will be applicable to certain problems and others will not.

This study adopted mixed methods in which both quantitative and qualitative span the process of research and combine the two approaches in order to collect both types of data (Bergman, 2008). This study used questionnaires as main tools for data collection from teachers and Physics students on all objectives. Observation of Physics lessons to identify teaching approaches and learning activities were also used. Furthermore observation checklists were used to establish the teaching-learning materials used in order to need quantitative and qualitative data to best understand the problem.

Therefore, this study was triangulation mixed methods research. Triangulation mixed methods approach is a set of procedures that researchers use to simultaneously collect both quantitative and qualitative data, analyze both dataset separately, compare the results from the analysis of both data sets, and make an interpretation as to whether the result support or contradict each other (Tashakkori & Teddlie, 1998).

This study collected data simultaneously using questionnaire from Physics teachers and students and at the same time lessons observed and material check lists were filled. This could be done in different ways, by using different methods or techniques of gathering data depending on the objectives of the study. It is more than simply collecting and analyzing both kinds of data; it also involved the triangulation of approaches so that the overall strength of a study is greater than either qualitative or quantitative research (Creswell & Plano, 2007). Mixed methodology strategy is a research that mixes quantitative and qualitative approaches (Bergman, 2010). In this research approach and method, the researcher looked at the process of arriving at effective solutions to the problems through scientific methods of systematic collection, analysis and interpretation of data (Tashakkori & Teddlie, 1998).

This study aimed at collecting information from respondents on instructional influences on the implementation of Physics curriculum in secondary schools in Bungoma County. The researcher designed a questionnaire for students and teachers as a tool for data collection. Physics teaching methods, teaching-learning materials and learning activities were observed using lesson observation and observation checklists also filled. The research considering issues such as economy, time available and the large population of Bungoma County, hence choice of mixed methods was suitable for this study. The use of mixed methods research was appropriate for this study, because the data was both qualitative and quantitative.

3.3 Research Design

Research design is the plan and the procedures for research that span the decision from broad assumptions to detailed methods of data collection and analysis (Denzin & Lincoln, 1994). This study adopted a descriptive survey design, which involved the use of questionnaire and observation methods of data collection. Descriptive survey is a research design where a researcher present oriented methodology used to investigate population by selecting samples to analyze and discover occurrences (Mitchell &

Jolley, 2007). Like all research, the goal of descriptive research design is to test hypothesis and answer questions.

Descriptive survey design provides numeric descriptions of some part of the population (Miles & Huberman, 1994). In this design the researcher describes and explains events as they are, as they were or as they will be. Descriptive survey design enabled the researcher to have a rapid data collection and ability to understand a population from a part of it (Gall, Borg, & Gall, 1996). This design is suitable for extensive research considering issues such as economy of the design (Silverman, 2000). Descriptive survey design was deemed appropriate for this study since research seeks to develop relevant true statements, ones that can serve to explain the situation that is of concern or that describe the casual relationship of interest (Neuendorf, 2002).

This was therefore the basis for choosing descriptive survey design for this study. Since the research sought to describe and account for existing conditions related to the instructional influences on the implementation of Physics curriculum in secondary schools in Bungoma County.

3.4. Research Area

Bungoma County as shown in Appendix VIII, is the third largest County in population in Kenya out of 47 counties. It comes after Nairobi and Kakamega counties. The County lies between latitude 00 28’ and latitude 10 30’ North of the equator, and longitude 340 20’ East and 350 15’ East of the Greenwhich meridian. The county covers an area of about 3032.4 square kilometers .The study area is part of the formerly western province of Kenya. This County borders the republic of Uganda to the North West, Trans-Nzoia County to the North-East, Kakamega County to the

East and South East, and Busia County to the West and South West (Bungoma County development plan, 2013). The County has nine Sub-Counties which include; Bungoma South, Bungoma Central, Bungoma West, Bungoma North, Bungoma East, Mt. Elgon, Cheptais, Bumula, and Kimilili, Bungoma.

The study was carried out in Bungoma County because it had been registering an average low performance of 36.3percent and a mean score of D+ (4 points out of 12 point scale) in Physics KCSE examinations (Bungoma County Director of Education Office, 2015). This poor performance was coupled with low enrollment in Physics of only 21.49%, yet in the County integrated development plan (2013-2017) the County strives to offer globally competitive education training, research and innovation for sustainable development (Bungoma County development plan, 2013).

Bungoma County in line with the national Education, science and technology plans was committed to improved teaching and learning environment in all educational institutions by investing in construction and equipping of school libraries, laboratories and resource centre (ibid). This County is also typical in that; the area is diversified in terms of national schools, County schools and Sub-County schools. The other diversities include; boys' schools, girls' schools, mixed schools, boarding schools, day schools, very well performing schools and very poorly performing schools in national examinations. Therefore the researcher selected Bungoma County in order to collect focused information.

3.5 Population and Sample

This study was conducted in Bungoma County, Kenya. The County consist of 283 public secondary schools and 12 private secondary schools with a secondary eligible age population of 150,738(75,597 boys and 75,141 girls) with an estimated 3228 teachers (Bungoma County Education Office, 2014). The target population consisted of all trained Physics teachers and form Three Physics students in the 283 public secondary schools in Bungoma County, Kenya. The County has an estimated 224 trained Physics teachers and 4148 form Three Physics students. Therefore the population in this study was 4372 teachers and students from Bungoma County.

A sample is part of the target population that has been procedurally selected to represent it (Silverman, 2000). Bergman (2008) noted that the sample size and sampling procedures is important in order to establish representation of the sample for generalization. Kothari (2009) argues that researchers select a sample due to various factors that may hinder studying the whole population. Mugenda and Mugenda (2003, P.42) suggested that: "for descriptive studies, ten percent (10%) of the accessible population is enough for generalization." Accordingly this study involved 10% of the (224) trained Physics teachers and 4148 form Three Physics students from Bungoma County.

Therefore, the sample consisted of 22(16 male and 6 female) trained Physics teachers who where HOS and 393(236 boys and 157 girls) form Three Physics students selected from the target population. Therefore the size of the sample was 415 respondents. This number 415 was chosen according to Teddlie and Tashakkori (2003) statistical method:

$$\text{Sample, n} = \frac{Target\ Population, N}{10}$$

Where: n- sample size; N-target population

In this study, purposive sampling was used to pick on Bungoma County out of 47 Counties in Kenya as the County of study. Purposive sampling is a non-probability sampling technique that allows a researcher to use cases that have the required information with respect to the objectives of the study (Creswell, 2003). Bungoma County was selected because performance in Physics is poor in most secondary schools according to KCSE (2014) and Bungoma County Director of Education result analysis (2015).

Stratified and simple random sampling techniques were used to select the schools. Stratified sampling is a type of probability sampling where respondents are grouped into two or more sub-groups based on a factor like; gender to achieve desired representation from various subgroups in the population (Denzin & Lincoln, 1994). The purpose of stratified sampling is to group population into homogenous subsets that share similar characteristics. It is also to ensure equitable representation of the population in the sample.

Simple random sampling is a probability sampling technique which involves giving a number to every subject or member of the accessible population and placing the number in a container and then picking any number at random (Strauss & Corbin, 1990). The subjects corresponding to the numbers picked are included in the sample (ibid). It also involves selecting a sample without bias from the target population and in addition to obtain a random (representative) sample.

The researcher listed all the schools in Bungoma County based on the nine Sub-Counties. The schools were stratified into three categories: Boys' boarding, Girls' boarding and co-education (mixed) schools. By using stratified sampling technique the researcher ensured that the three categories of the schools are represented in the sample in the proportion in which they appear in the population (Silverman, 2003).

The use of this technique helped to improve representativeness and also to bring on board any differences that may exist between the school categories (Tuckman, 1978).

Simple random sampling was then employed to select one category of school from each Sub-County from the list of all schools in respective Sub-Counties. This ensured that each member of the target population had an equal and independent chance of being included in the sample. This made up seven boys' schools, seven girls' schools and eight mixed schools totaling to 22 public secondary schools participating in the study. This is according to Mugenda and Mugenda (2003) who recommended a random sample of 30% for a descriptive research study.

Purposive sampling technique was employed to select the Physics Head of Subject (HOS) from each sampled school. HOS were handpicked because they were informative or they were possessing required characteristics. This technique also saved time and money (Strauss & Corbin, 1990). There were 22 Head of Subject (HOS) chosen as respondents one from each sampled school, representing the administrative authority in their respective Physics departments of their schools. Physics HOS were therefore hoped to have all the information about instructional influences on implementation of Physics curriculum in their respective schools.

Purposive, simple random and stratified sampling techniques were employed to select student respondents. Purposive sampling was used to select the form Three class from each sampled school. Purposive sampling was then employed to select students who had chosen Physics as an examinable subject. For single gender schools simple random sampling was then used to select 10 students from each of the single streamed schools; 15 students from a double streamed school and 20 students from schools with three and more streams. Using simple random a total of 174 respondents were selected from seven boys' schools and 121 respondents selected from seven girls' schools. In total 295 respondents were selected from single gender schools.

Respondents in mixed schools were first stratified based on gender (boys & girls). Simple random sampling technique was then employed to select 10, 15 or 20 respondent from each single streamed, double streamed or a three and more streamed schools respectively. In all cases, for mixed schools simple random sampling was done to ensure that the sample was made up of half of each gender. A total of 98 respondents were selected from mixed schools. Therefore, 393 student respondents were involved in this study. In total, the study involved 415 respondents (393 students and 22 teachers). The summary of the sampling frame is shown in Table 3.1.

Table 3.1. Sampling frame

Units	Population	Sample Size	Sampling Method (s)
Schools	283	22	Stratified, and simple random sampling methods
Teachers	224	22	Purposive and simple random sampling methods
Students	4148	393	Purposive, stratified and simple random methods

Source: Researcher (2017)

3.6 Research Instruments

Research instruments are the tools used for collecting data (Denzin & Lincoln, 1994). The data collection instruments used in this study were questionnaires, lesson observation guide and observation checklist. The selection of these tools was guided by the nature of data to be collected, the time available as well as the objectives of the study (Bergman, 2008). The overall aim of this study was to determine instructional influences on the implementation of Physics curriculum in secondary schools in

Bungoma County. This study was mainly concerned with teachers' and students' views, opinions, and attitudes about implementation of the Physics curriculum in secondary schools. Such information could best be collected through the use of questionnaire, lesson observation and observation checklist (Kothari, 2009).

3.6.1 Questionnaires

A questionnaire is a collection of items to which a respondent is expected to react, usually in writing (Kothari, 2009). Kothari (2009, P.100) noted that questionnaires had the following merits: there is low cost even when the universe is large and widely spread geographically, it is free from bias, respondents have adequate time to give well thought out answers, respondents who are not easily approachable, can be reached conveniently, large samples can be used and thus the results can be made more dependable and reliable.

Questionnaires were used since this study was concerned with variables that cannot be directly observed such as views, opinions, perceptions and feelings of respondents. Such information was best collected through questionnaires (Silverman, 2000). The sample size was also quite large 393 students and 22 teachers (415) and given the time constraints, questionnaires were the ideal tool for data collection. The target population (Physics teachers and form Three Physics students) was also largely literate and unlikely to have difficulties responding to questionnaire items.

In this study two sets of questionnaires were used: one for Physics teachers and another for Physics students. The questionnaires for teachers and students were structured to incorporate both closed-ended and open- ended questions. This was to enable the researcher balance between the quality and quantity of data collected (Bergman, 2008). But on the other hand, provide more information. This balance between the quality and quantity of information was useful for a fuller explanation of the phenomena under investigation.

3.6.1.1 Teachers' Questionnaires (TQ)

Teachers' Questionnaire (TQ) as presented in Appendix I, was used to collect information on the following objectives; teaching methods, learners' motivation, teaching-learning materials, teaching-learning activities and scope of the syllabus. This study adapted some items on curriculum implementation from standardized and validated item from; Taylor & Francis, European Union and Changeiywo et al., (2010). Some of the items on teaching-learning materials and scope of the syllabus were modified to fit the present study. Items were adapted to determine and describe the influence of teaching methods, learners' motivation, teaching-learning materials, teaching-learning activities and scope of syllabus on the implementation of Physics curriculum in secondary schools in Bungoma County.

Teachers' Questionnaire consisted of (30 items) closed-ended and (2 items) open-ended based on the likert-type of scale having three, four or five degree of agreement. Questionnaire items were arranged in the order of research objectives. The first five questions asked for background information on: gender, age, academic qualification, teaching experience and previous performance in Physics.

There were eleven questions on teaching methods. The respondent was asked "How often do you use the following teaching methods in teaching Physics?" The response was on likert scale having four degree of agreements such as; Very often = 4; Often = 3; Rarely = 2; Never = 1.There were three questions on learners' motivation. The respondent was asked " Rate the following statements to indicate learners' motivation in Physics" The response was on likert scale having five degree of agreement such as;

Strongly agree = 5; Agree = 4; Undecided = 3; Disagree = 2; Strongly disagree = 1. There were three questions on teaching-learning materials. The respondents were asked “Indicate the level of availability of the following teaching materials in your school”. The response was on likert scale having three degree of agreement such as: Available and adequate = 3, Available and not adequate = 2, Not available = 1.

There were three questions on teaching-learning activities. The respondents were asked “Rate the following learning activities in the teaching of Physics to show frequency of use” The response was on likert scale having four degree of agreement such as; Very frequently = 4; Frequently = 3; Rarely = 2; Never = 1.There were five questions on scope of the syllabus. The respondents were asked “Rate the following statements on scope and coverage of the syllabus in your school” The response was on likert scale having five degree of agreement such as; Strongly agree = 5; Agree = 4; Undecided = 3; Disagree = 2; Strongly disagree = 1.

Finally, there were two open-ended questions. The first asked respondents “What do you think are the major influences on the implementation of Physics curriculum in your school?” and the second question was “What do you think should be done in order to manage these influences in your school?” Open-ended questions gave respondents complete freedom of response in their own words but the amount of space provided desired a brief answer.

3.6.1.2. Students’ Questionnaires (SQ)

Students’ Questionnaire (SQ) as presented in Appendix II, were used to collect information on teaching methods, learners’ motivation, teaching-learning materials, teaching-learning activities and scope of the syllabus . This study adapted some items on curriculum implementation from standardized and validated item from; Taylor &

Francis, European Union and Changeiywo et al., (2010). Some of the items on teaching-learning materials and scope of syllabus were modified to fit the present study. Items were adapted to determine and describe the influence of teaching methods, learners' motivation, teaching-learning materials, teaching-learning activities and scope of syllabus on the implementation of the Physics curriculum in secondary schools.

Students' Questionnaire consisted of (28 items) closed-ended and (2 items) open-ended based on the likert-type of scale having three, four or five degree of agreement. Questionnaire items were arranged in the order of research objectives. The first three questions asked for background information on: gender, present class/form, and previous performance in Physics.

There were eleven questions on teaching methods. The respondent was asked "How often are the following teaching methods used in Physics?" The response was on likert scale having four degree of agreements such as; Very often = 4; Often = 3; Rarely = 2; Never = 1.There were three questions on learners' motivation. The respondent was asked " Rate the following statements to indicate your motivation in Physics" The response was on likert scale having five degree of agreement such as; Strongly agree = 5; Agree = 4; Undecided = 3; Disagree = 2; Strongly disagree = 1. There were three questions on teaching-learning materials. The respondents were asked "Indicate the level of availability of the following teaching materials in your school" The response was on likert scale having three degree of agreement such as; Available and adequate = 3, Available and not adequate = 2, Not available = 1.

There were three questions on teaching-learning activities. The respondents were asked "Rate the following statements to reflect on learning activities in Physics instruction" The response was on likert scale having four degree of agreement such as; Very frequently = 4; Frequently = 3; Rarely = 2; Never = 1.There were five questions on scope of the syllabus. The respondents were asked "Rate the following statements on scope and coverage of the syllabus in your school" The response was on likert scale having five degree of agreement such as; Strongly agree = 5; Agree = 4; Undecided = 3; Disagree = 2; Strongly disagree = 1.

Finally, there were two open-end questions. The first asked respondents "What do you think are the major influences on the implementation of the curriculum for Physics in your school?" and the second question was "What do you think should be done in order to manage these influences in your school?" Open-ended questions gave respondents complete freedom of response in their own words but the amount of space provided desired a brief answer.

3.6.2 Observation Schedule

Observation is a data collection method by use of senses to perceive and understand the experiences of interest to the researcher (Tashakkori & Teddlie, 1998). Observation method has the following advantages: subjective bias is eliminated, if observation is done accurately. Secondly, the information obtained relates to what is currently happening. Thirdly, observation is independent of respondents' willingness to respond as such less demanding of active cooperation on the part of respondents (Kothari, 2009.p.96). This study used two types of observation; lesson observation schedule (LOS) and observation checklists (OC). The observations were meant to assess the extent to which the teaching methods used were student-centered, as well as find out the degree to which students are motivated in classrooms. Use of observations was also meant to find out teaching-learning materials used and learning activities students engage in to acquire Physics knowledge and skills.

3.6.2.1 Lesson Observation Schedule (LOS)

Lesson observation schedule as indicated in Appendix III, had four sections. It was used to obtain primary data during classroom lessons or laboratory lessons. In the first part of the schedule the observer filled in data on: name of the school, class, time, subject and roll or number of boys and girls in the class. The Second section of the schedule was the introduction of the lesson where the observer filled in data on teaching methods, learners' motivation, teaching-learning materials and teaching-learning activities used during the introduction of the lesson.

The third section of the schedule was the lesson development where the observer filled in data on teaching methods, learners' motivation, teaching-learning materials and teaching-learning activities employed during lesson development. The fourth section of the schedule was the conclusion in which the observer filled in data on teaching methods, learners' motivation, teaching-learning materials and teaching-learning activities employed during the conclusion of the lesson

Some photographs and video tapes were also taken (see appendix, V) during lesson observation with the consent from the school principal to show the situation in Physics classrooms in Kenyan secondary schools.

3.6.2.2 Observation checklist (OC)

Laboratory observation checklist as indicated in Appendix IV, was meant to cross-check the availability, adequacy teaching-learning materials and opportunities for individual level hands-on practice. The observation checklist consisted of a table having basic teaching-learning materials/resources for Physics found in the laboratory. It was used to gather primary data on teaching and learning materials (resources) from Physics laboratories by the help of laboratory assistants.

The laboratory observation checklist included materials like: textbooks, meter rules, mirrors, lenses, microscopes, ammeters, voltmeters, thermometers, stop watch, Bunsen burner, dry cells, bulbs, smoke cell and vacuum flask. Observation checklists were rated in a three-point Lickert scale ranging from "Available & adequate = 3" to "not available = 1". Laboratory stores and preparation rooms were cross checked to identify equipments that were available and are used as teaching-learning resources. Brief general commends were also made on each checklist for a particular school on adequacy of materials.

Some photographs and video tapes were also taken as shown in appendix VII, with the consent from the school principal to display some examples of teaching-learning materials found in Physics laboratory. Observations allowed the researcher, to gain firsthand experience without informants, record information as it occurs, explore topics that may be uncomfortable to informants and notice unusual aspects (Gall, Borg & Gall, 1996).

This was to enable the researcher to balance between the quantity and quality of data collected and on the other hand, provide more information (Silverman, 2000). So as to verify information obtained from teachers' and students' questionnaires. Secondly, it assisted in availing information which could not be captured in the teachers' and students' questionnaires yet the information is useful for a fuller explanation of the phenomena under investigation.

3.7 Ethical Issues Observed

The major ethical issue in this study entailed the privacy and confidentiality of the respondents and sampled schools. Obtaining a valid sample entailed gaining access to specific lists and files, which itself was an infringement on the privacy and confidentiality of the respondents, but this was the only way to construct a sampling frame and generate a representative sample (Mugenda & Mugenda, 2003). A written communication to the administration (principals) of the sampled schools requesting for permission to carry out the study in their schools was observed during this study (Bergman, 2008). A covering letter with official authority from the university; university identity card was also used as a means of identification (Mitchell & Jolley, 2007. p.532.). The benefits of the study to the respondents, school and nation at large was explained in the introduction part of the questionnaires. Confidentiality was maintained at all times and respondents had the freedom to ignore items that they do not wish to respond to (Morgan, 2007). All participants in this study were anonymous they were asked to participate voluntarily and without disclosing their identity by not writing their names on the questionnaire. This was done by ensuring honest and openness (Creswell & Plano, 2007). The information collected was under full responsibility of the researcher as an individual and therefore ensured the information was safely kept and used only for the purposes of the study (Mitchell & Jolley, 2007. P. 533). The collected data was stored on paper for short-term and for purposes of long-term storage after analysis it was stored electronically (Silverman, 2003).

3.8 Validity and Reliability of the Research Instruments

3.8.1 Validity of the research instruments

Validity of an instrument is the degree to which an instrument measures what it is supposed to measure (Creswell, 2003). To establish content validity, the instruments were given to two experts (supervisors) in the school of education in the department of Curriculum Instruction and Education Media (CIEM) of Moi University. One was requested to assess what concept the instrument is trying to measure. The other was asked to determine whether the set of items accurately represents the concept under study. This was to improve the validity of the instruments and to evaluate the relevance of each item in the instrument in relation to the objectives and rate each item on the scale of very relevant (4), quite relevant (3), somewhat relevant (2), and not relevant (1).

Validity was determined using Content Validity Index C.V.I = items rated 3 or 4 by both judges divided by the total number of items in the questionnaire. This can be symbolized as follows:

$$C.V.I. = \frac{Agreed\ items\ by\ both\ judges}{Total\ number\ of\ items}$$

The validity index of the instruments in this study was α = 0.86 or 86% before pilot study. This shows that the instruments were highly valid to collect relevant information hence a high degree of validity of the collected data.

A pilot test on the instruments was done in four schools on four teachers and 56 students to make the instruments dependable. Those schools, teachers and students involved in the pilot study were not included in the actual study to avoid contamination (Silverman, 2000). After pilot study the instruments were modified to improve their validity as follows: instruments on teaching-learning materials were changed from using; Strongly agree = 5 to Strongly disagree =1 to using Available & adequate = 3 to Not available = 1. Teaching-learning activities were also modified by changing from using: Strongly agree = 5 to Strongly disagree = 1 to using: Very frequently = 4 to Never = 1. This was meant to increase their validity to make the instruments dependable and to be used in the actual study.

To increase internal validity, extraneous variables were also controlled and randomization was done during sampling (Miles & Huberman, 1994). This was meant to ensure representativeness of the sample in relation to the target population hence increasing external validity.

After pilot test validity of the instruments was established using the Statistical Package for Social Sciences (SPSS) computer programme. The items summed to obtain a validity index coefficient: $\alpha = 0.92$. According to Mugenda & Mugenda (2003), items with validity coefficient of at least 0.80 or more are valid for use in the study.

3.8.2 Reliability of the research instruments

Reliability is a measure of the degree to which a research instrument yields consistent results or data after repeated trials (Denzin & Lincoln, 1994). To establish reliability, first, the test-retest technique was used to assess reliability in data. Test-retest technique involved administering the same instruments twice to the same group of subjects. A pilot test of the instruments was done in four schools on four teachers and 56 students to make the instruments dependable (Bergman, 2008). During pilot study the second test was administered two weeks after the first test keeping constant the initial conditions (Kothari, 2009). Those schools, teachers and students involved in the pilot study were not included in the actual study to avoid contamination (Silverman, 2003).

Secondly, reliability of the instruments was determined using internal consistency technique. Internal consistency of data is determined from scores obtained from a single test administered by the researcher to a sample of subjects. In this approach, a score obtained in one item was correlated with scores obtained from other items in the instruments. In this study, the Kunder-Richardson (K-R) 20 formula was used to compute reliability coefficient. The K-R 20 formula is as follows:

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

Where: KR_{20} = Reliability coefficient of internal consistency

K = Number of items used to measure the concept

S^2 = Variance of all scores

s^2 = Variance of individual items

The reliability Cronbach's coefficient Alpha of the instruments in this study was α = 0.83 or 83% before pilot. This shows that the instruments were highly reliable to collect relevant information hence a high degree of reliability of the collected data. The instruments on teaching-learning materials by changing from using: Strongly agree = 5 to Strongly disagree =1 to using Available & adequate = 3 to Not available = 1. Teaching-learning activities were also modified by changing from using: Strongly agree = 5 to Strongly disagree = 1 to using: Very frequently = 4 to Never = 1. This was meant to increase their reliability to make the instruments dependable and to be used in the actual study.

After pilot study reliability of the instruments was established using the SPSS computer programme. The reliability coefficient was: α = 0.89 or 89% which showing that instruments were highly reliable to collect relevant information. According to Mugenda and Mugenda (2003.p.96), items with reliability coefficient of atleast 0.80 or more implies that there is a high degree of reliability of data collected. Random sampling was also used in selecting respondents in order to increase reliability of the study. Overall, all the instruments were first pre-tested to ensure validity and reliability of the instruments for data collection.

3.9 Data Collection Procedures

The researcher had developed a proposal over a period of about twelve months under the guidance of the supervisors. When the proposal was ready, the researcher obtained permission from Graduate school Moi University through a letter which was used to process a research permit from the National Commission for Science, Technology and Innovation (NACOSTI) to proceed with the study. After obtaining the research permit shown in Appendix X, the researcher sought clearance from the County Director of Education and County Commissioner respectively. The principals and Physics teachers of the participating school were informed of their schools' inclusion in the study and their co-operation requested through an introduction letter shown in Appendix IX.

The researcher then provided orientation training to three (3) research assistants for a period of one week (7days) on data collection; master the observation schedules, ethical considerations to be observed and time management. The researcher with the help of research assistants proceeded to pilot (pre-test) the instruments in four schools on four (4) teachers and (56) students. The pilot study was done in May, 2017.

First, the researcher and research assistants observed ethical issues by introducing themselves through the administrations of selected schools. This was through a written letter of introduction (covering letter) shown in Appendix IX, to accompany questionnaires. Self-administered questionnaires were use to collect primary data from teachers and students. Respondents were asked to complete the questionnaires hand-delivered to them by research assistants. The researcher and research assistants distributed questionnaires to the selected respondents and because of various reasons, like number of subjects, costs and time available; respondents were allowed humble time to complete responding to questions. All questionnaires were gathered after the given time for data analysis.

At the same time, lesson observation schedules were filled by the observer to identify the teaching methods used, learners' motivation, learning materials and learning activities in classroom. Observation checklists were also filled to confirm availability of teaching-learning materials in the sampled schools.

The observations were meant to assess the extent to which the teaching methods used were student-centered and how effectively were teachers implementing the curriculum. Lesson observations forms were also used to find out how students were motivated in classrooms and teaching-learning activities students engage in during the learning process. The observers collected quantitative and narrative data as per the lesson observation form (Silverman, 2003). Each lesson observation took 40minute or 80 minutes depending on if the lesson was a single or double.

3.10 Pilot Study

To determine the validity and reliability of the instruments, a pilot study was conducted in May, 2017 prior to the actual data collection. Four schools were involved outside those selected for the actual study (Silverman, 2000). Two of the schools were mixed, but two were single gender (one was a boys' school and the other a girls' school). In each of the four schools, one teacher for Physics was selected and 14 form Three Physics students randomly selected making a total at 15 respondents from each of the four schools. The total number of respondents in the pilot study was 60 (4 teachers and 56 students). Pilot study schools and participants were not involved in the actual study to avoid contamination of results (Bergman, 2010). The pilot study was to help the researcher to adjust the instruments in preparation for the main study.

3.11 Data Analysis Procedures

The independent variables in this study were (instructional influences) while the dependent variable was (implementation of curriculum) which were both categorical in nature. Therefore both qualitative and quantitative data was collected. Qualitative data was collected using open-ended questions and lesson observations schedule while quantitative data was collected using closed-ended questionnaires and observation checklists. It was therefore suitable to analyze data using both descriptive and inferential analysis techniques (Creswell & Plano, 2007).

Data collected from the field was compiled, sorted, edited, to ensure accuracy and consistence to facilitate coding. Quantitative data collected using closed-ended questions and observation checklist was coded using numbers while qualitative data from open-ended questions and lesson observation was organized in narratives into themes. Data was then coded into a coding sheet and keyed into the computer. Quantitative data was analyzed using inferential statistics while qualitative data was analyzed using descriptive statistics. Descriptive analysis refers to the use of measures of central tendencies and measures of dispersion. The descriptive statistics used for analysis of quantitative data were percentages and means while the inferential statistics used were chi-square, Pearson Product-Moment correlation and multiple regression analysis. Qualitative data was organized in narrative format and analyzed in themes.

A percentage is the proportion of a subgroup to the total group or sample and ranges from 0% to 100% (Denzin & Lincolin, 1994). Percentages are extremely important, especially if there is need to compare groups that differ in size. Mean is the average of a set of scores or measurements (Bergman, 2010). Mean is calculated by adding up all the scores and dividing the sum by the total number of scores. Mean is used to describe the central measure if the sample is normally distributed. As stated earlier, the SPSS was used to compute percentages and means. The descriptive statistics; percentages and means were employed to describe categorical data regarding the influence of teaching methods, learners' motivation, teaching-learning materials, teaching-learning activities and scope of syllabus on implementation of the curriculum for Physics curriculum in secondary schools.

The inferential statistics employed include; chi-square (χ^2), correlation and multiple regression analysis. Inferential analysis was used to draw conclusions concerning the relationships and differences found in research results (Morgan, 2007). Chi-square (χ^2) was employed to establish relationship between instructional influences and implementation of the Physics curriculum both of which are categorical.

Chi-square is a statistical technique which attempts to establish relationship between two variables both of which are categorical in nature. This technique deals with differences between frequencies rather than scores (Kothari, 2009). This was because the data was categorical and drawn from a population with uniform distribution in which all alternative responses were equally likely. In this study, the independent variables (instructional influences) and dependent variable (implementation of the Physics curriculum) are both categorical in nature. The technique compares the proportion observed in each category with what would be expected under the assumption of independence between the two variables. If the observed frequency greatly departs from what is expected, then we reject the null-hypothesis that the two variables are independent of each other. We would then conclude that one variable is related to the other.

Therefore, it was suitable to analyze data using chi-square. The computer used for analysis would give the chi-square value and also the actual probability of the computer Chi-square value. If the probability of the computed Chi-square value is less than the level of significance set, the null hypothesis was rejected and concluded that the two variables were not independent of each other and vice versa (Kothari, 2009).

Pearson Product-Moment correlation (r) is an inferential statistics most commonly used when both variables are categorical (Mitchel & Jolley, 2007). The computation of correlation coefficient yielded a statistic that ranged from -1 to 1. This statistic is called a correlation coefficient (r). The correlation coefficient tells the researcher: the degree of relationship between two variables; instructional influences and implementations of Physics curriculum. Correlation also tells direction of the relationship between two variables. If the coefficient is positive (+), it meant that there was a positive relationship between two variables. A negative relationship (-), meant that two variables vary together in opposite directions. The Correlation analysis was also used to determine the strength and direction of association between the two variables and select variables for further statistical analysis e.g., regression analysis (Mugenda & Mugenda, 2003.p.133).

Multiple regression (R^2) was employed to determine whether teaching methods, learners' motivation, teaching-learning materials, teaching-learning activities and scope of the syllabus together predicted implementation of Physics curriculum (Silverman, 2000). The five independent variables were considered together (in one equation) as predictors of implementation of Physics curriculum (dependent variable). In multiple regression analysis, the regression model was of the form:

$$Y= \beta_o + \beta_1 X_1 + \beta_2 X_2 + \text{.................................} \beta_n X_n + \sum$$

Where:

Y - is the depended variable

$X_{1\text{-}n}$ - are the independent variables

β_o - is the constant

$\beta_{1\text{-}n}$ - are the regression coefficients or change induced in Y by each X

$\sum$ -is the error.

Regression analysis also yielded a statistic called coefficient of determination or R^2. The R^2 refers to the amount of variation explained by the independent variable or variables. In order to determine regression and test of significance using a computer, for every value of b (slope) the computer would give a t-value and the probability level for each t-test. Regression analysis also yielded an F-statistic and its' probability level. The F-statistic tells the researcher whether one or more of the independent variables significantly predicted the dependent variable at the selected probability level. Regression and test of significance was done with the assumptions that:

(a) Each independent variable is linearly related to the dependent variable.
(b) The observations are independent of each other, which imply that the sample was drawn at random.
(c) Homogeneity of variance exist, at each level of X, the variance of the Y values is constant.

(d) Y values are normally distributed around the mean at each level of X in the population. Finally, data gathered through interviews, observation and document analysis will be analyzed qualitatively.

Data was analyzed using the Statistical Package for Social Science (SPSS) version 20 at $\alpha = 0.05$ level of significance. Data was analyzed using SPSS by entering coded data into the computer which yielded descriptive and inferential statistics. This was chosen at the discretion of the researcher and because it is usually the most commonly used value. At this level of significance, the researcher was 95 percent confident that if any effect noticed was due to the instructional influences and not as a result of chance. Thus in 100 possible cases, only 5 of such could be due to chance (Kothari, 2009). Interpretations were then made on the computer output to explain instructional influences on the implementation of the Physics curriculum in secondary schools in Bungoma County. The summary of the data analysis methods is shown in Table 3.2.

Table 3.2: Summary of the Data Analysis Procedures

Research objective (s)	**Data analysis methods used**
Methods of teaching	Percentages, means, chi-square, correlation & multiple regressions
Learners' motivation	Percentages, means, chi-square, correlation & multiple regression
Learning materials	Percentages, means, chi-square, correlation & multiple regression
Learning activities	Percentages, means, chi-square, correlation & multiple regression
Scope of the syllabus	Percentages, means, chi-square, correlation & multiple regressions

Source: Researcher (2017)

3.12 Chapter Summary

This chapter has discussed pragmatism research paradigm, mixed methods, descriptive survey design. Bungoma County is discussed as research area, population and sampling of schools, teachers and students. Purposive, stratified and simple random sampling techniques were the main ones used in this study. Research instruments discussed include; questionnaires, lesson observation schedules and observation checklists. Ethical issues, validity and reliability of the instruments, data collection procedures are also discussed. Pilot study, data analysis procedures including descriptive ones like percentages and means while the inferential statistics being chi-square, Pearson product moment correlation and multiple regression analysis.

CHAPTER FOUR

DATA PRESENTION, ANALYSIS, INTERPRETATION AND DISCUSSION

4.0 Introduction

This chapter presents findings of the study, which have been discussed under the thematic areas and sub-sections in line with the objectives. The thematic areas were: bio-data of respondents, administration and return of data collection instruments rate, data analysis and interpretation and summary of the findings.

4.1. Bio-Data Of Respondents

In order to establish various characteristics of the respondents, demographic information such as gender, age, academic qualification, teaching experience, and students' academic performance were also requested. Bio-data of respondents was obtained to provide parameters that support the study although they were not directly under study.

4.1.1 Gender

The respondents were asked to indicate their gender. Description of respondents by gender is shown in Table 4.1.1.

Table 4.1.1. Category of Respondents by Gender

Gender	**Physics teachers**		**Physics students**		**Total**	
	F	%	F	%	F	%
Male	16	72.72	236	60.0	252	60.7
Female	6	27.2	157	39.9	163	39.2
Total	**22**		**393**		**451**	**100**

As can be discerned from Table 4.1.1, of the total 393 student respondents 236 (60.0%) were males while 157 were females which accounts for 39.9%. Male teachers were 16 (72.7%) while 6(27.2%) were females Physics teachers respectively. In both categories of respondents the males overcome the females with the biggest discrepancy on the side of teachers. This was because the target population was having a greater number of males than females. The findings indicate that there are fewer females in Physics classes in Kenyan secondary schools. These finding agree with the findings by Semela (2010) in the study on who is joining Physics and why? "Factors influencing the choice of Physics among Ethiopian university students" the study found out that gender influences Physics enrollments in learning institutions.

4.1.2. Age

Only teachers were asked to indicate their age since students were regarded to be of the same cohort. The range of teachers ages are shown in Table 4.1.2.

Table 4.1.2. Teachers' Age

Age (year)	Male		Female		Total	
	F	%	F	%	F	%
BELOW 30	4	27.27	3	13.63	9	40.90
31-40	6	18.18	3	13.63	4	18.18
41-50	4	9.09	0	0.00	2	9.09
0ver 50	2	9.09	0	0.00	2	9.09
Total	**16**	**72.72**	**6**	**27.27**	**22**	**100**

As shown in Table 4.1.2, majority of teachers 9 (40.9 %) were young aged between 31-40 years of age. Amazingly there was no female teacher for Physics who was above 40 years of age. This result indicated that it is only recently that female teachers started joining Physics as a teaching subject. It is also possible that when they start aging they opt to teach their second subject other than Physics. Therefore female students are likely to miss female role models to encourage them to study Physics.

4.1.3. Academic Qualification

Teachers were further asked to indicate their highest academic qualification and it is shown in Table 4.1.3.

Table 4.1.3. Academic Qualification of teachers

Level of Education	**Gender**		**Percentage**	
	Male	Female	Total	(%)
Diploma	4	3	7	31.31
Bachelors' Degree	10	4	14	63.63
Masters Degree	1	0	1	4.54
PhD	0	0	0	0.00
Others	0	0	0	0.00
Total	**14**	**7**	**22**	**100.0**

As shown in Table 4.1.3, of the 22 teachers, a majority 14 (63.6%) Physics teachers in secondary schools had earned a bachelors' degree in secondary Education, a 4-year course for those intending to teach in high school. Of the surveyed teachers 7 (31%) had a diploma in secondary Education, a 3-year course. Interestingly, only one teacher accounting 5% had a masters Degree but the same teacher specialized in educational administration related field. However, non-of the teachers had a doctorate degree.

4.1.4. Teaching Experience

Teachers were asked to indicate the number of years they had been teaching Physics. The summary of the findings is shown in Table 4.1.4.

Table 4.1.4: Teachers' classification according to their teaching experience

Teaching experience (Years)	Frequency (N)	Percentage (%)
0- 5	7	31.81
6-10	9	40.90
11-15	4	18.18
16 and above	2	9.09
Total	**22**	**100.00**

As can be discerned from Table 4.1.4, of the total 22 teachers who participated in this study 9 (40%) had taught high school Physics for 8.0 years on average. Some of them 7 (31%) had a teaching experience of less than 5years. Four others accounting for (18%) had a teaching experience of 11 to 15years. Only two teachers (9%) had taught Physics for more than (16) years. These findings are consistent with the study by Semela (2010) who found out that inexperienced teachers ineffectively implement the Physics curriculum. Hence, resulting to low enrolments in Physics at all levels.

4.1.5 Academic performance

Students were asked to indicate there previous performance in Physics in terms of percentage. The lowest score indicated by the respondents was 2% (E) whereas the highest score was 90.0% (A). The computer was used to calculate the average score for all the 415 student respondents, which was found to be 48.4% (C). This finding shows that low performance in Physics still persist in Bungoma County as in the case nationally.

Teachers were asked to indicate their school KCSE average mean score and mean grade respectively for the last three years. The results showed that the school with the lowest mean score had 2.8 (D-) but the school with the highest mean score had 9.1(B plain). The average mean score was calculated using a computer and it was found to be 5.4 (C-). These disturbing findings are in agreement with the findings by Njoroge et al., (2014) and Muriithi et al., (2013) who in their studies lamented that Physics performance over the years in summative evaluation (KCSE) after the secondary school cycle had been poor. As a matter of fact Njoroge et al., reported an average score of 42.0% in KCSE examinations.

4.1.6 Administration and return rate of data collection instruments

This study used three types of data collection instruments: Questionnaires, lesson observation schedule and observation checklist. In this study, a total of 22 Physics teachers and 452 students were sampled giving a total of 474 respondents.

Questionnaires were administered to the respondents directly and collected. The questionnaire administration and return rate is shown in Table 4.1.5.

Table 4.1.5: Questionnaires administration and return rate

Category of respondents	Administered	Return	%
Physics teachers	22	22	100.00
Physics students	452	393	86.94
Total	474	415	87.55

As observed from Table 4.1.5, a total of 22 questionnaires were distributed to Physics Heads of Subject (HOS), all were filled and returned giving a response return rate of 100%. Further, 452 questionnaires were distributed to form three Physics students, out of which 393 questionnaires were filled and returned, giving a students' questionnaire response rate of 86.9%. In total 415 questionnaires were returned accounting for 87.5% of all questionnaires distributed.

Further, 11 lesson observations schedules were filled from 11 different schools each from a different Sub-County, six of which were in classroom lessons and five were practical lessons in the laboratory. In addition, 14 laboratory material observation checklists from 14 different schools each from a different Sub-County were also filled to cross check the availability of basic Physics materials. All the lesson observation schedules and observation checklists were collected for analysis. The return rate of lesson observations schedules and checklists was 100% since they were being filled by the researcher and research assistants.

4.2 Influence of Teaching Methods on the Implementation of Physics Curriculum in Secondary Schools

The first objective in this study was to investigate the influence of teaching methods on the implementation of Physics curriculum in secondary schools in Bungoma County. To achieve this objective, the respondents were asked to indicate how often the listed methods are used in implementing the curriculum for in their respective schools. Teaching methods were defined in terms of inquiry-based, laboratory practical, project, discovery, ICT, mastery learning, lecture, discussion, question-answer, and problem solving and demonstration method. The responses were recorded on a four-point likert scale ranging from: Very often = 4 to Never = 1. Data on this objective was analyzed under the hypothesis "teaching methods do not influence implementation of the curriculum for Physics for secondary schools in Kenya."

4.2.1. Data from Teachers' and Students' closed-ended Questions

Data from Teachers' and Students' questionnaire are presented on Table 4.2.

Table 4.2: Influence of teaching methods on the implementation of Physics curriculum in secondary schools

	Response							
Teaching method	**Very often**		**Often**		**Rarely**		**Never**	
	N	%	N	%	N	%	N	%
B1. Inquiry-based	159	38.3	160	38.6	59	14.2	36	8.7
B2. Laboratory	117	28.2	192	47.5	92	22.2	9	2.2
B3. Project	28	6.7	71	17.1	147	35.4	169	40.7
B4. Discovery	62	14.9	99	23.9	123	29.6	131	31.6
B5. ICT integrated	31	7.6	67	16.1	110	26.5	207	49.9
B6. Mastery learning	117	28.2	155	37.3	76	18.3	67	16.1
B7. Lecture	227	54.7	119	28.7	45	10.8	22	5.5
B8. Discussion	167	40.2	168	40.5	67	16.1	12	2.9
B9. Question-answer	234	56.4	142	34.2	29	7.0	9	2.2
B10. Problem solving	209	50.4	160	38.6	33	8.0	10	2.4
B11.Demonstration	172	41.1	169	40.7	53	12.8	19	4.6
Mean	**138**	**33.3**	**137**	**33.0**	**76**	**18.3**	**63**	**15.1**

As can be discerned from Table 4.2, of the total 415 respondents, a majority 275 (66.3%) indicated that teaching methods influenced curriculum implementation. These results suggest relationship between teaching methods and implementation of Physics curriculum in secondary schools. Although more than half of the respondents indicated that teaching methods influenced the implementation of Physics curriculum, a significant proportion 139(33.4%) indicated opposite; that teaching methods have no influence on implementation of Physics curriculum.

4.2.2 Data from Teachers' and Students' open-ended Questions

The narrative report finding from open-ended questions concurred which questionnaire finding. One student had written:

> In class teachers don't allow students to participate or give their ideas. Teachers prefer to give the answer and move to the next concept without the understanding of the students. This causes confusion among the students and they end up dropping the subject when it becomes optional at form Three. Some students in my school choose to take Physics but fail in examination.

4.2.3 Data from lesson observation

Classroom and laboratory lesson observation revealed that the teaching methods used in Physics are predominantly theoretical with traditional lecture, question-answer, problem- solving and demonstration methods being widely used. Further evidence to support the data from questionnaires is a photograph in appendix V, which shows form Three students in an overcrowded laboratory lesson. This Overcrowding does not favor individualized or student-centered pedagogies. Traditional methods of teaching were observed in seven (63.6%) out -of the eleven lessons observations made while student-centered teaching methods like: IBT, laboratory practical, project, discovery and ICT integration were observed in only four (36.4%) out of eleven observations. Hence, it clearly emerged from lesson observations that student-centered teaching is lacking in Physics classrooms in Kenyan schools.

This study established that teachers predominantly use non student- centered methods like; lecture, question answer, problem solving and demonstration methods. Therefore this study noted that teachers are to blame for ineffective curriculum implementation for Physics as they are the ones who choose the teaching methods to use.

This study finding is consistent with the finding by Semela (2010) who pointed out that instructors are the cause for the low enrollment and low performance in Physics (p.332). At this point, he seemed to underscore teachers' failure to employ learner-centered teaching methods in one hand and their inability to effectively implement the curriculum.

The laboratory lesson observation further revealed how lack of students' direct interaction with equipments impacted negatively on their practical skills in curriculum implementation (See Appendix, V). In this connection observer II reported:

Physics curriculum implementation is negatively impacted by theoretical approaches to the teaching of practical skills instead of using student-centered approaches. This is due to the limited time for the lesson and inadequate apparatus for doing practical. This as a result de-motivates students and low academic achievement is observed in the subject in KCSE examinations.

These results agreed with the findings by Tsegay and Ashraf (2015) in the study on influence of senior secondary teachers on students' achievement in Gao-Kao (Chinese College Entrance Examination) in China. They found out that many teachers use different pedagogical principles to make their classes participatory. They further argued that curriculum implementation is a process which involves planning and the teaching methods used in presenting content according to the specific objectives.

Nevertheless, it was concluded that, students and teachers in secondary schools regard teaching methods as a major factor that influenced implementation of the Physics curriculum in secondary schools.

Based on the questionnaire and observation findings, the researcher carried out data analysis using chi-square to test the null hypothesis that,

"*There is no relationship between teaching methods and the implementation of Physics curriculum in secondary schools.*" The results of chi-square are summarized in Table 4.3.

Table 4.3: Chi-square results on influence of teaching methods on implementation of the Physics curriculum

	Chi-square	Observed frequency (O)	Expected frequency (E)	sig.
	254.296	5	16	0.001
df	25			

0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 16.0

The results on Table 4.3, shows computed chi-square value; F (5,254) = 16.0; df = 25*;* *p*<.05). This gave a significant value of 0.001 which is below the P value = 0.05, hence the researcher rejected the null hypothesis that stated that *"There is no relationship between teaching methods and the implementation of Physics curriculum in secondary schools."* Therefore the alternative hypothesis which states that there is significant influence of teaching methods on implementation of the Physics curriculum in secondary schools was accepted.

It was concluded that there is relationship between teaching methods and implementation of Physics curriculum in secondary schools.

4.3. Influence of Learners' Motivation on the Implementation of Physics Curriculum In Secondary Schools

The second objective posed in this study was to determine the influence of learners' motivation on the implementation of Physics curriculum in secondary schools in

Bungoma County. To achieve this objective, the respondents were asked to rate statements to indicate motivation in Physics. Motivation was defined in terms excellent performance, rewards, enjoyment of Physics lessons and revising Physics during free time. The responses were recorded on a five-point likert scale ranging from: Strongly agree = 5 to Strongly disagree = 1. Data on this objective was analyzed under the hypothesis "learners' motivation does not influence the implementation of the Physics curriculum in secondary schools in Bungoma County."

4.3.1 Data from Teachers' and Students' closed-ended Questions

Data from Teachers' and Students' questionnaire are presented on Table 4.4.

Table 4.4: Influence of learners' motivation on the implementation of Physics curriculum in secondary schools

	Response									
Learners' motivation	**SA**		**A**		**U**		**D**		**SD**	
	N	%	N	%	N	%	N	%	N	%
C1. Excellent performance	254	60.7	84	202	10	2.4	61	14.7	8	1.9
C2. Rewarding good performance	204	49.1	6	1.4	33	7.9	89	21.4	83	20.0
C3. Enjoy Physics lessons	232	55.9	26	6.3	46	11.0	7	1.7	4	1.0
C4. Love revising Physics	259	62.1	62	14.9	73	175	19	46	2	0.5
Mean	**237**	**57.1**	**26**	**6.2**	**59**	**14.7**	**44**	**106**	**24**	**5.7**

Key: SA= strongly agree; A= Agree; U= Undecided; D= Disagree; SD= Strongly disagree

The findings in Table 4.4, indicate that a majority of the respondents 237(57.1%) and 26(6.2%) strongly agreed and agreed respectively that motivation influenced the implementation of the curriculum for Physics for secondary schools. This implied that: 263 (63.3%), of the respondents generally held that motivation influences implementation of the Physics curriculum. However, a minority 68(16.3%) respondents indicated that motivation does not influence implementation of the Physics curriculum in secondary schools with 59(14.7%) having been undecided.

4.3.2 Data from Teaches' and Students' open-ended Questions

The finding from teachers' and students' open-ended questions seemed to support the data reported in the closed–ended questions. For instance, one of the teachers wrote that:

> Motivation is an important drive for learning and achievement in KCSE examination. Teachers cultivate a learning habit and self-responsibility within their students. This is through rewards and positive reinforcement in classroom by encouraging each and every student to be part of the learning process.

One of the student was also in agreed with the teachers' sentments by reporting that teachers gave them moral support and confidence to revise well for the examinations through rewards and career guidence which became a driving force for their academic achievement. The respondent clearly explained this as follows:

> My Physics teacher encouraged me to do my best in order to enter a Physics related career like engineering or medicine. Therefore I decided to work hard, and this is the driving force towards my good results in examinations.

It is interesting to note what one female student had to write in regard to motivation:

> My teacher motivates me by rewarding me through comments he makes in class when I answer a question correctly. One day the teacher said, " that is good, your future career is very bright". I feel this influences my interest in the subject. But when teachers make

> negative comments to the students in class, students gets scared and discouraged from learning.

Students gave a variety of other motivational influences on implementation of the curriculum for Physics which included: having been told that Physics is difficult by peers, a dislike for the only Physics teacher in the school and Physics being full of mathematical problems. Lack of career guidence in schools was also identified by teachers as a possible influence on the implementation of the curriculum.

4.3.3 Data from lesson observation

Lesson observation results showed that learners' motivation greatly influenced implementation of Physics curriculum. The classroom and laboratory lesson observation gave more evidence which was strikingly similar on the teachers' personality, instruction method, verbal rewards and the level of motivation of learners. It was revealed that a teacher who reinforce and reward learners through positive comments, makes them make more efforts in class hance raising their level of motivation. Rewards and reinforcement cultivate extrinsic motivation and interest in students to learn by themselves.

Regarding this; observer I; briefly describes the scenario as follows:

> In class learners who had answered a question correctly and were positively reiforced tended to lifted up their hands to make another attempt, unlike those who had previously answered wrongly or had not made any attempted. It was only in two classes that the teacher encouraged other students to also try. But in most cases the teacher kept on giving chance to the same student to answer questions.

These finding agreed with the study by Changeiywo, Wambugu and Wachanga (2010) who reported that motivation makes learners like the subject, build competence and confidence in their abilities hence greatly predict students achievement. A teacher is one of the five key factors that influence learners' motivation. This in turn improve the performance in Physics hence implementation of Physics curriculum.

Based on questionnaire and lesson observation findings, the researcher carried out data analyzed using chi-square to test the null hypothesis that, "*There is no relationship between learners' motivation and the implementation of Physics curriculum in secondary schools*." The results of chi-square are summarized in Table 4.5.

Table 4.5: Chi-square results on influence of learners' motivation on the implementation of Physics curriculum

	Chi-square	Observed frequency (O)	Expected frequency (E)	sig.
	129.337	5	34.6	0.001
Df	11			

0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 34.6

The results on Table 4.5, shows computed chi-square values; F (5,129) = 34.6; df = 11; $p<.05$). This gave a significant value of 0.001 which was below the P value = 0.05, hence the researcher rejected the null hypothesis that stated that *"There is no relationship between learners' motivation and the implementation of Physics curriculum in secondary schools."* Therefore the alternative hypothesis which states that there is significant influence of learners' motivation on the implementation of the Physics curriculum in secondary schools was accepted.

It was therefore concluded that there is relationship between learners' motivation and implementation of Physics curriculum in secondary schools.

4.4 Influence of Teaching and Learning Materials on the Implementation of Physics Curriculum in Secondary Schools

The third objective in this study was to investigate the influence of teaching-learning materials on the implementation of Physics curriculum in secondary schools in Bungoma County. To achieve this objective, the respondents were asked to indicate the level of availability of materials for Physics in their school. Teaching-learning materials were defined in terms of: text books, meter rules, mirrors, lenses, microscopes, Ammeters, Voltmeters, thermometers, stopwatches, Bunsen burners, dry cells, bulbs, smoke cells and vacuum flask. The responses were recorded on a three-point likert scale ranging from: Available and adequate = 3 to not available = 1. Data on this objective was analyzed under the hypothesis “teaching - learning materials does not influence implementation of the Physics curriculum in secondary schools.”

4.4.1 Data from Teachers’ and Students’ closed-ended Questions

Data from Teachers’ and Students’ questionnaire are presented on Table 4.6.

Table 4.6: Influence of teaching-learning materials on the implementation of Physics curriculum in secondary schools

Material	Response		
	Available & adequate	**Available & not adequate**	**Not available**
Physics text book	31.12	54.00	14.88
Meter rules	40.30	55.80	3.90
Mirrors	35.20	48.40	16.40
Lenses	24.00	60.52	15.48
Microscopes	10.20	44.18	45.62
Ammeters	38.21	52.72	9.07
Voltmeters	36.64	54.64	8.72
Thermometers	42.45	50.24	7.30
Stopwatches	24.40	64.82	10.78
Bunsen burners	31.24	51.60	17.16
Dry cells	34.62	52.50	12.88
Bulbs	28.68	48.52	22.88
Smoke cells	21.40	15.62	62.98
Vacuum flasks	7.12	24.46	68.42
Mean	**28.97**	**48.43**	**22.60**

The results in Table 4.6, shows that teaching-learning materials for Physics were available & adequate at a mean of 28.97 (28.97%). Majority of the schools 48.43(48.43%) were found to have inadequate teaching-learning materials. This finding indicated that most schools in Bungoma County had materials for Physics available but they were not adequate for use by all students. Notably, a mean of 22.6 schools which account for (22.60%); totally lack basic Physics teaching and learning materials.

4.4.2. Data from Teaches' and Students' open-ended Questions

Teaching-learning materials were overwhelmingly reported in the open-ended questionnaires as having influence on the implementation of Physics curriculum. Teachers and students stressed that the greatest challenge faced in learning Physics was the inadequate teaching-learning materials. In stressing the inadequate materials in schools one teacher had to say:

> Our school management gives priority to other school needs like food, salaries for school workers and games facilities when the funds available are limited instead of buying learning materials.

4.4.3 Data from lesson observation

The finding form lesson observation agreed with data from questionnaires that implementation of the curriculum was influenced by inadequate laboratory instruments and equipments. Therefore the inadequate learning materials limit the direct hands-on practical exposure to students. The narrative report of observers clearly confirmed the shortage of materials and extremely limited individual hands-on practice. Accordingly, the report by observer III stated:

> As a result of limited resources, it was common practice for teachers to divide students into groups of 5-10 members during practical lessons. In extreme cases one student was asked to demonstrate following the teachers' instructions as others take turns to look at the demonstration.

4.4.4 Data from Observation Checklist

Availability of 14 basic Physics teaching-learning materials was cross checked in the school laboratory. A photograph in appendix VII, shows some of the materials. Data from observation checklist is presented on Table 4.7.

Table 4.7: Availability of basic teaching-learning materials in schools

Material	Response		
	Available & adequate	**Available & not adequate**	**Not available**
Physics text book	33.11	50.00	16.88
Meter rules	40.20	54.80	4.91
Mirrors	33.24	48.41	18.40
Lenses	27.20	57.52	15.48
Microscopes	4.29	44.18	51.62
Ammeters	36.20	40.72	24.62
Voltmeters	36.64	34.64	28.70
Thermometers	41.45	49.25	9.30
Stopwatches	24.40	62.72	12.76
Bunsen burners	29.24	50.61	20.15
Dry cells	33.62	48.50	17.87
Bulbs	26.67	47.52	26.88
Smoke cells	11.43	15.62	52.95
Vacuum flasks	7.12	24.46	68.42
Mean	**27.47**	**44.92**	**27.61**

The results in Table 4.7, shows that basic teaching-learning materials for Physics were available & adequate at a mean of 27.47 (27.47%). Most of the materials 44.92(44.92%) were available but inadequate, 27.61(27.61%) of the basics materials were not available. These findings were closely similar to the finding in teachers' and students' questionnaire and strongly indicated that most schools in Bungoma County had materials for Physics, but they were inadequate for use by all students.

The findings from observation checklists indicated that 72.39% of the basic Physics learning materials cross checked were available in schools while 27.61% were missing. Some of the materials notably missing included; a vacuum flask and a smoke cell. It was reported that some teachers borrowed a vacuum flask used for storing teachers' tea or school workers for demonstrations. This was because there was no vacuum flask specifically as a science teaching aid. Accordingly, the inadequate learning materials limited the direct hands-on practical exposure of students. In turn, this influenced the implementation of Physics curriculum.

Physics text books were also available but inadequate for the students population in the school at that time when data was being collected. The student book ratio was 4:1 in most schools but in rare cases the ratio was 2:1. A photograph showing almost empty Physics text book shelve in a school library is shown in Appendix VI. Nevertheless, it was concluded that teaching-learning materials influenced implementation of the Physics curriculum in secondary schools.

Based on the questionnaire and observation findings, the researcher carried out data analysis using chi-square to test the null hypothesis that, "*There is no relationship between teaching-learning materials and the implementation of Physics curriculum in secondary schools*." The results of the chi-square are summarized in Table 4.8.

Table 4.8: Chi-square results on influence of teaching-learning materials on the implementation of Physics curriculum

	Chi-square	observed frequency (O)	Expected frequency (E)	sig.
	455.4112	5	59.3	0.001
df	6			

0 cells have (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 59.3.

The results on Table 4.8, shows computed chi-square values; F (5,455) = 59.3; df = 6*;* $p<.05$). This gave a significant value of 0.001 which is below the P value = 0.05, hence the researcher rejected the null hypothesis that stated that *"There is no* *relationship between teaching-learning materials and the implementation of Physics curriculum in secondary schools."* Therefore the alternative hypothesis which states that there is significant influence of teaching-learning materials on the implementation of Physics curriculum in secondary schools was accepted.

It was concluded that there is a relationship between teaching-learning materials and the implementation of Physics curriculum in secondary schools.

4.5 Influence of Teaching and Learning Activities on the Implementation of Physics Curriculum In Secondary Schools

The fourth objective in this study was to investigate the influence of teaching-learning activities on the implementation of Physics curriculum in secondary schools in Bungoma County. To achieve this objective, the respondents were asked to rate the following teaching-learning activities to show frequency of use in schools. Teaching-learning activities were defined in terms of group discussion, simulations and problem solving. The responses were recorded on a four-point likert scale ranging from: Very frequently = 4 to Never = 1. Data on this objective was analyzed under the hypothesis "teaching - learning activities does not influence the implementation of Physics curriculum in secondary schools."

4.5.1 Data from Teachers' and Students' closed-ended Questions

Data from Teachers' and Students' questionnaire are presented on Table 4.9.

Table 4.9: Influence of teaching-learning activities on the implementation of Physics curriculum in secondary schools

Learning activities	Response							
	Very frequently		Frequently		Rarely		Never	
	N	%	N	%	N	%	N	%
E1. Discussions	294	70.7	88	21.0	28	6.7	5.0	0.2
E2. Simulations	95	22.8	126	30.3	55	13.2	139	33.5
E3. Problem solving	312	75.1	78	18.7	24	5.7	1	0.0
Mean	233	56.3	97	23.4	36	8.5	48	11.6

In view of the responses as presented in Table 4.9, it was found that 233(56.3%) respondents very frequently engage in teaching-learning activities in the classrooms. Similarly, teaching-learning activities were frequently engaged in at 97(23.4%). This imply that in total 330(79.5%) of the respondents held that teaching-learning activities influenced implementation of the Physics curriculum. However, only 36(8.5%) and 48(11.6%), rarely or never engage in activities respectively.

4.5.2 Data from Teaches' and Students' open-ended Questions

A part from inadequate teaching-learning materials in schools learning activities that promote participatory and individualized learning were reported to be missing. Practical knowledge and skills were not being promoted in most schools. Though most schools had a school laboratory the materials for doing practical were either not available or not enough for the large students population. The available materials did not much the class size and as a result most teachers employed demonstration method. One of the students had to lament regarding learning activities as greatly influencing the implementation of Physics curriculum and said:

> During laboratory demonstrations students observed the teacher or laboratory assistant carry out the learning activity that we are supposed to do individually in an experiment. Therefore for most of the students Physics is boring since we are not actually involved in the learning process.

This is a very critical issue that needs to be managed in order to promote learners' practical knowledge and skills. If indeed vision 2030 and SDGs are to be met then the practical learning activities should be many to prepare learners for life in scientific-technological era as stated by the SDGs (2015).

Teachers agreed that learning activities influenced implementation of Physics curriculum. One of the teachers in the open-ended questionnaires wrote:

> Physics is best learned through inquiry based activities that engage the learners' mind. This school has the ability to facilitate such Physics learning activities. They include science and engineers fair, Physics contests, excursions and tours but because of the negative attitude towards Physics funding of the activities become difficult.

4.5.3 Data from lesson observation

The finding in teachers' and students' questionnaires was supported by classroom and laboratory observations that were made. The observation report clearly indicated that the inadequate learning materials resulted to the extreme minimal learning activities. In this regard observer I reported:

> Though some laboratory activities were arranged but over 50.0% teaching-learning activities were dominated by question-answer, discussion, problem solving and taking note. This did not allow laboratory hands-on practice activities for learners to individually make discovery of knowledge by themselves.

The class observation further revealed that teachers rarely gave chance to the students to respond to their questions especially the slow learners due to the pressure to cover the planned content.

Access to Physics classes is not the current challenge given that the government pays tuition fees for all students in public schools, but quality learning and academic achievements are the main arguable issue in secondary Education in Kenya today.

Based on the teachers' and students' questionnaire findings, the researcher carried out data analyzed using chi-square to test the null hypothesis that, "*There is no relationship between teaching-learning activities and the implementation of Physics curriculum in secondary schools".* The results of chi-square are summarized in Table 4.10.

Table 4.10: Chi-square results on influence of teaching-learning activities on the implementation of Physics curriculum

	Chi-square	Observed frequency (O)	Expected frequency (E)	sig.
	329.884	5	31.9	0.001
df	12			

0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 31.9.

The results on Table 4.10, shows computed chi-square values; F (5,329) = 31.9; df = 12*;* p<.05). This gave a significant value of 0.001 which is below the P value = 0.05, hence the researcher rejected the null hypothesis that stated that *"There is no relationship between teaching-learning activities and the implementation of Physics curriculum in secondary schools."* Therefore the alternative hypothesis which states that there is significant influence of teaching-learning activities on the implementation of the Physics curriculum in secondary schools was accepted.

It was concluded that there is relationship between teaching-learning activities and the implementation of Physics curriculum in secondary schools.

4.6 Influence of Scope and Coverage of the Syllabus on the Implementation of Physics Curriculum in Secondary Schools

The fifth and last objective in this study was to find out the influence of scope and coverage of the syllabus on the implementation of Physics curriculum in secondary schools in Bungoma County. To achieve this objective, the respondents were asked to rate statement on scope and coverage of the curriculum for Physics. Scope and coverage of the syllabus were defined in terms of too wide, adequate time allocated, work load, teaching pace and completion of form One and Two topics at the end of each year respectively.

The responses were recorded on a five-point likert scale ranging from: Strongly Agree = 5 to Strongly disagree = 1. Data on this objective was analyzed under the hypothesis "*There is no relationship between scope and coverage of syllabus and the implementation of Physics curriculum in secondary schools*."

4.6.1 Data from Teachers' and Students' closed-ended Questions

Data from teachers' and Students' Questionnaires are presented in Table 4.11.

Table 4.11: Influence of scope and coverage of the syllabus on the implementation of Physics curriculum in secondary schools

Scope of syllabus	Response SA		A		U		D		SD	
	N	%	N	%	N	%	N	%	N	%
F1. The syllabus is too wide to be covered within the available time	149	35.9	75	18.1	30	7.2	53	12.8	108	6.0
F2. The time allocated for physics is adequate to cover planned topics	56	13.5	170	41.0	17	4.1	130	31.3	41	10.1
F3. The work load affects the coverage of the Physics syllabus	134	32.3	107	25.8	39	9.4	59	14.2	76	8.3
F4. The syllabus is too wide that teachers teach at a fast pace	113	27.2	94	22.7	28	6.7	97	23.4	83	0.0
F5. I never completed form One and form Two topics in the year respectively	93	22.4	60	14.5	5	1.2	61	14.7	195	7.0
Mean	**109**	**26.2**	**101**	**24.3**	**24**	**5.7**	**80**	**19.3**	**101**	**24.3**

Key: SA= Strongly agree; A= Agree; U= Undecided; D= Disgree; SD=Strongly disagree

As shown in Table 4.11, 109 (26.2%) and 101(24.3%) respondents, strongly agreed and Agreed respectively. A mojority 210(50.5%) of the teachers and students agreed that the scope and coverage of the syllabus influenced the implementation of the Physics curriculum in secondary schools. In contrast a minority 181(43.6%) disagreed that scope and coverage of the syllabus influenced implementation of Physics curriculum. Notably, 24(5.7%) respondents were undecided. Overall, the findings indicated that a significantly higher percentage of the respondents 210(50.5%) held that the scope and coverage of the syllabus had an influence on implementation of Physics curriculum in secondary schools.

4.6.2 Data from Teaches' and Students' open-ended Questions

The reports given by teachers and students in the open-ended questions were consistent with data from close-ended questions. One teacher in identifying major influences on implementation of Physics curriculum wrote:

> The scope of the syllabus for Physics is not in par with the allocated time for the subject in the school timetable. The time allocated is not enough to allow adequate coverage of all planned topics and objective in the curriculum.

Majority of the teachers also identified workload as a key influence on implementation of Physics curriculum. Students seemed to agree with teachers that scope and coverage influenced implementation of the curriculum. Accordingly, one student had reported in an open-ended questionnaire that:

> Our teacher for Physics did not cover all form One and form Two topics. The teacher had a tendency of skipping one or two topics to be able to complete the syllabus for the sake of the fourth coming examinations.

4.6.3 Data from lesson observation

It was observed that only six (42.8%) schools could be able to completed form Three syllabus by the end of the year out of 14 in which lesson observations were made. Majority, eight (57.2%) of the schools were still lacking behind in the syllabus coverage.

Hence, it is not surprising if students fail in KCSE examinations when the syllabus is not effectively covered.

In this regard, the study by Shikuku (2012) offered an empirical support indicating that late or non-coverage of the syllabus contributed to the poor performance. The study further suggested that students who had in-depth and timely syllabus coverage were likely to be more successful in examinations compared to those who had a shallow and late coverage.

Based on the findings, the researcher carried out data analysis using chi-square to test the null hypothesis that, "*There is no relationship between scope and coverage of the syllabus and the implementation of Physics curriculum in secondary schools"*. The results of chi-square are summarized in Table 4.12.

Table 4.12: Chi-square results on influence of scope and coverage of the syllabus on the implementation of Physics curriculum

	Chi-square	Observed frequency (O)	Expected frequency (E)	sig.
	321.720	5	19.8	0.001
Df	20			

0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 19.8.

The results on Table 4.12, shows computed chi-square values; F (5,321) = 19.8; df = 20; $p<.05$). This gave a significant value of 0.001 which is below the P value = 0.05, hence the researcher rejected the null hypothesis that stated that *"There is no relationship between scope and coverage of the syllabus on the implementation of Physics curriculum in secondary schools."* Therefore the alternative hypothesis which states that there is relationship between scope and coverage of the syllabus and implementation of Physics curriculum in secondary schools was accepted. It was concluded that there is relationship between scope and coverage of the syllabus and implementation of Physics curriculum in secondary schools.

Based on the findings from chi-square, Pearson Product- Moment correlation (r) was used to establish the degree of relationship between instructional influences and implementation of Physics curriculum in secondary schools. The correlation was performed specifically to find out if the relationship between instructional influences and implementation of the curriculum is linear, the population from which the sample is selected is normal and if the variance is homogeneous. The findings are shown in Table 4.13.

Table 4.13: Pearson Product- Moment correlations on instructional influences on the implementation of Physics curriculum in secondary schools

Variable	r	r^2
Teaching methods	0.277**	0.076
Learners' motivation	0.321**	0.103
Teaching-learning materials	0.382**	0.145
Teaching-learning activities	0.373**	0.139
Scope and coverage of syllabus	-0.121**	0.014

****. Correlation is significant at the 0.01 level (2-tailed).**
***. Correlation is significant at the 0.05 level (2-tailed).**

Results presented in Table 4.13, shows that there was a significant correlation between instructional influences and the implementation of Physics curriculum. Teaching methods were found to have a significant influence on the implementation of Physics curriculum (r = 0.277, $p < 0.05$). The results indicated r^2 to be 0.076 this imply that 7.6% implementation of the Physics curriculum was predicted by teaching methods.

Similarly, learners' motivation was found to have a significant influence on the implementation of Physics curriculum as show on Table 4.13, (r = 0.321, $p < 0.05$). The results shows r^2 to be 0.103 implying that 10.3% implementation of Physics curriculum was predicted by learners' motivation.

Teaching-learning materials displayed a significant influence on the implementation of Physics curriculum (r = 0.382, $p < 0.05$). The results shows r^2 to be 0.145 implying that 14.5% implementation of Physics curriculum was predicted by teaching-learning materials.

Teaching-learning activities indicated a significant influence on the implementation of Physics curriculum (r = 0.373, $p< 0.05$). The results shows r^2 to be 0.139 which implies that 13.9% implementation of Physics curriculum was predicted by teaching-learning activities.

Unlike the first four instructional influences, there was a small but significant influence of scope and coverage of the syllabus on the implementation of the Physics curriculum (r = 0.014, $p< 0.001$). The results shows r^2 to be 0.014 which implies that 1.4% implementation of the Physics curriculum is predicted by the scope and coverage of the syllabus.

Indeed, the teaching and learning materials were found to have had the highest influence on the implementation of Physics curriculum by 14.5% as shown on Table 4.13, than all other factors under investigation in this study. This gives a perception that teaching- learning materials had the overall highest impact on the implementation of Physics curriculum in secondary schools.

This findings in Table 4.13 are in agreement with various previous studies like; Kyule et al., (2016), Kapting'ei and Ruto., (2014) and Kosgei et al.,(2014). They all converged in a conclusion that implementation of curr in Kenyan secondary schools face a serious challenge of inadequate learning materials. This is compounded by non-usage of the few materials that were available. Teaching-learning activities came second at 13.9% on influencing implementation of the Physics curriculum. The teaching-learning activities enable learners to gain knowledge through the activities taken. Muriithii et al., (2013) established that high level of learning activities through project method enhanced performance by 7.6%. Learning activities also enabled superior academic achievements and hence more effective implementation of the curriculum.

As shown on Table 4.13, this study found out that Scope and coverage of the syllabus had the lowest influence on the implementation of the Physics curriculum. This finding was in line with the findings by Mkandawire (2010). Mkandawire (2010) asserted that scope and coverage of the syllabus depended on the available time. Mkandawire further argued that allocated time did not necessarily translate into actual learning if teachers spend some of the allocate time on other activities. Kyule et al., (2016) noted that “curriculum implementation is a composite of the learner, teacher, teaching resources, teaching methodologies, anticipated experiences and outcomes (P.76).”

These findings indicated that the students and teachers in secondary schools viewed that teaching methods, learners’ motivation, teaching-learning materials, teaching-learning activities were the major factors that determine the effectiveness in implementation of the Physics curriculum. These four factors were confirmed to be important and critical therefore should be considered when planning curriculum implementation. The scope and coverage of the syllabus was found to be a minor factor influencing implementation of Physics curriculum.

Furthermore, Multiple Regression was performed in an attempt to determine whether a group of variables (teaching methods, learners’ motivation, teaching-learning materials, teaching-learning activities and scope of the syllabus) together influence implementation of the Physics curriculum. The Regression model summary is shown in Table 4.14.

Table 4.14: Multiple Regression on instructional influences on the implementation of the Physics curriculum

R	**R square**	**Adjusted R Square**	**Std. Error of the Estimation (∑)**	R Square change	F change	Df1	Df	Sign. F change
0.65	0.422	0.389	0.7527	0.422	8.21	13	152	0.01

Predictors: Teaching methods, learners' motivation, teaching-learning materials, teaching-learning activities and scope of syllabus.

Dependent variable: implementation of curriculum.

As shown in Table 4.14, the regression model was significant. The coefficient of determination was 0.422. In the model $r^2 \times 100 = 0.422 \times 100\% = 42.2\%$. This imply that 42.2% of variance in the implementation of the curriculum was explained by teaching methods, learners' motivation, teaching-learning materials, teaching–learning activities and scope of the syllabus .

These findings indicated that there are other instructional influences; including those hidden in the error term contributing up to 57.8% variance in the implementation of the curriculum for Physics that were not included in the model. Basing on the findings the predictors were significant and are therefore dependent as opposed to being independent of each other. Since the results were significant it meant that all the predictors in this study are critical in predicting implementation of the Physics curriculum.

These results were consistent with the findings reported by Mkandawire (2010) who concluded that there are many factors that affect implementation of curriculum in schools in developing countries. Mkandawire (2010) identified national economy, teaching learning materials like books, in-service training of teachers, the number of pupils in the class, education monitoring and the learners' home environment as some of the factors influencing implementation of curriculum. Therefore, the following section discusses the research findings.

4.7 Discussion of the Study Findings

Education has kept on changing with time to meet the needs of a dynamic society. There has been concerns all over the globe on the education offered; the changes in education; the curriculum and the content in relation to the challenges that face our society. Hence the call for Education for sustainable development as envisaged in the SDG 2015.This study determined instructional influences on the implementation of the Physics curriculum in secondary schools.

The first objective for this study was to establish the influence of teaching methods on the implementation of the Physics curriculum in secondary schools in Bungoma County. Results obtained in Table 4.2, showed that a majority 66.3% of teachers and students in secondary schools held that teaching methods influenced the implementation of the Physics curriculum in secondary schools. The results of the Chi-square test obtained indicated that teaching methods and implementation of the Physics curriculum are related. The Pearson product-Moment correlation test on Table 4.13, showed that teaching methods influenced up to 7.6% implementation of the Physics curriculum. These findings are similar to findings reported by Muriithi et al., (2013), Uside et al., (2013) and Njoroge et al., (2014) who noted that teaching methods influenced implementation of Physics curriculum hence students' achievement in the subject.

Muriithi et al., (2013, p.8) in the study on project method and learner achievement in Physics in Kenyan secondary schools established a 7.6% improvement in Physics performance. The researcher further argued that the method increases student participation which leads to high content retention. The study found out that project method was a learner-centered method, where the teachers' role is to guide and facilitate the learning process.

Muriithi et al., (2013) further argued that the use of project method is an excellent way of increasing students' participation and mitigating academic achievement of the learners. This is because learners are put in position to apply the knowledge learnt as they make the project. The authors further argued that project method produces superior grades compared to those exposed to traditional methods by inculcating in the learner problem solving skills, conceptual understanding, and Positive attitude to learning. Muriithi et al., (2013) further observed that both girls and boys have the capability of achieving high grades when effective methods are applied during the instructional process.

Uside et al., (2013) studied effect of discovery method on secondary school students' achievement in Physics in secondary schools in Kenya and found out that discovery method has the potential to improve learners' achievement mean from 53.0% to 62.9% for the high achievers while for the low achievers the mean improved from 15.0% to 25.0%. The researchers in the study reported an average performance gain of 10.0% which agrees with this study which has found out a close average percentage gain of 7.6% as shown on Table 4.13.

These study findings are consistent with findings by Uside et al., (2013) who communicated that a teaching methods that promotes positive interaction between the learners and content to be learned trains students to use conflict to stimulate the search for more information and rethinking of conclusions. The researchers contended that discovery method; one of the students-centered approaches enhanced memory, retention and instilled confidence in students. The method also assisted students to remember and apply knowledge accurately.

Njoroge et al., (2014) studied the effect of Inquiry Based Teaching (IBT) and found a mean performance gain of 12.6% when IBT is used instead of traditional teaching methods like lecture and question answer methods. The researchers argued that IBT enhances the achievement of learners. This study established a mean gain of 7.6% which is consistent with the findings by Njoroge et al., (2014). These two studies further agree with the finding by Kapting'ei and Rutto (2014) in the study on challenges facing laboratory practical approach in Physics instruction in Kenyan District secondary schools.

The duo blamed the ineffective implementation of Physics curriculum on the kind of practical activities that teachers and students engaged in during teaching-learning process. This study gave a clear indication that student-centered pedagogies such as; inquiry-based, laboratory practical, project, discovery and ICT integration are effective in implementation of curriculum. Hence, they help in mitigating academic achievement of learners.

Information communication technology integration is one of the modern teaching methods advocated for by many previous studies including; Kola (2013), Jimoyiannis and Komis (2007) and Buabeng-Andoh (2012). Despite huge efforts to position ICT as a central tenet in curriculum implementation in Kenya, the reality remains that a very limited technology is put into use in the classroom. This study found out that 76.5% schools never use ICT integration method; the greatest factor contributing to the limited use being the unavailability of computers.

Buabeng-Andoh (2012) in the study on factors influencing teachers' adoption and integration of ICT reported that 78% of the schools had inadequate computers for use in the classroom. He argues that improved availability and access to technology resources by teachers, students, and administrative staff is essential in improving teaching and management of schools. Failure by teachers to used student-centered pedagogies posed a major challenge to effective implementation of the curriculum.

Kola (2013) contended that ICT integration in education has the potential to improve on traditional teaching methods by injecting more student-centre approaches. With availability of presentation software such as power point, the teacher can prepare slides well in advance and teach with the aid of an overhead projector, thus saving a lot of time. ICTs can also be used for handling of student records, student assessment, timetabling and communication.

Secondly, this study sought to determine the influence of learners' motivation on the implementation of the Physics curriculum in secondary schools in Bungoma County. A majority 63.3% of the respondents as shown on Table 4.4 indicated that learners' motivation influences implementation of Physics curriculum in secondary schools. The Chi-square test showed that there is relationship between learners' motivation and implementation of the Physics curriculum.

The Pearson Product-Moment correlation test shown on Table 4.13 indicated that learners' motivation influence the implementation of the Physics curriculum by

10.3%. These study findings are in agreement with findings reported by Changeiywo et al., (2010), Tsegay and Ashraf (2015) and Momanyi et al., (2010).

Changeiywo et al., (2010) studied students' motivation towards learning secondary school Physics through Mastery Learning Approach (MLA). Changeiywo et al., (2010) found out that MLA boosts learners' motivation towards learning Physics in secondary schools, which in turn improved performance in the mean score for Physics by between 18.71% and 23.3%. The researchers argued that MLA enhances implementation of Physics curriculum by further suggesting that the use of MLA in Physics teaching would minimize gender disparity. The study recommended that curriculum developers need to encourage the use of MLA to improve the effectiveness in the Physics curriculum delivery. These study findings are consistent with findings of Changeiywo et al., (2010) who established a 10.3% influence of motivation on the implementation of the Physics curriculum.

According to Changeiywo et al., (2010), there are two types of motivation; extrinsic and intrinsic motivation. Extrinsic motivation is directed at earning rewards that are external to a learner while intrinsic motivation is as a result of inherently interest or enjoyment Motivation makes learners to like the subject, build competence and confidence in their abilities. This will in turn improve the performance in the subject. Therefore teachers should find ways to build a sense of internal motivation based on interest, enjoyment during the learning process and a purpose to learn and understand. As found out by Changeiywo et al.,(2010) motivation arouses the students' interest and attention, raises their expectancies of success in academic work and gives them incentives and rewards that they value. Motivated learners perform well hence effective achievement of the goals of education.

Tsegay and Ashraf (2015) studied the influence of senior secondary school teachers on students' achievement in Gao-Kao (Chinese College Entrance Examinations) in China. The study established that teaches have a responsibility of motivating learners and learners motivation goes parallel with students' achievement when internal motivation reaches at its peak. Phillipson and Phillipson, 2012 as cited by Tsegay and Ashraf (2015) noted that factors that influence students' academic achievement may include cognitive ability, students' motivation, efforts as well as academic engagement. Momanyi et al., (2010) studied gender differences in self-efficacy and academic performance in science subjects among secondary schools in Lugari District Kenya and reported that self-efficacy is especially important in learning challenging subjects (such as Physics and other sciences).

It is argued that teachers play a dominant role in students' motivation (Tsegay & Ashraf, 2015). These imply that a teacher has the responsibility to influence the students' motivation to learn through a variety of teaching decisions and approaches. It is also important that a teacher adopt a teaching approach that will enhance the four dimension of motivation namely attention, relevance, confidence and satisfaction to learn for effective implementation of the curriculum. This assertion is in support to the study by Changeywo et al., (2010) which established that students who hold negative stereotype image of physics, and technology in society are usually discouraged from pursuing scientific disciplines and usually performed poorly in the Physics.

Thirdly, this study sought to find out the influence of teaching and learning materials on the implementation of the Physics curriculum in secondary schools in Bungoma County. Majority respondents 48.43% as shown on Table 4.6 indicated that teaching-learning materials are available and not adequate in schools hence influencing implementation of Physics curriculum in secondary schools. The Pearson Product-Moment correlation test on Table 4.13 indicated that teaching-learning materials influenced the implementation of the Physics curriculum by 14.5%.

The influence of teaching-learning materials on the implementation of the Physics curriculum was found to be the highest among the five instructional factors under investigation in this study. Most of the teachers had reported in open-ended questions that the limited resources in school do not allow individual students to perform experiments at free time. This limits learning activities to the classroom time. Moreover, it does not allow students to extent practical learning during free time to promote creativity and cover the syllabus in time. This result converged with findings by MKandawire (2010), Chaplongoi (2014), Onojerena (2015) and Kyule et al., (2016) who reported in their studies that without teaching-learning materials implementation of the curriculum is ineffective.

For instance Mkandawire (2010) studied challenges of curriculum implementation in learning institutions. The study found out that instructional materials and equipments were in short supply or may not be available at all in schools. The researcher further observed that most schools had no text books or writing materials, no chalk, no science apparatus, inadequate or out of-date library. With population explosion, classrooms were overcrowded and learners were made to share whatever little stocks of materials and furniture available. This finding has been confirmed by this study as evident on a form Three class photograph shown in appendix, V. Mkandawire (2010) argued that in such situations, teachers' effectiveness is hampered and becomes almost impossible for the teacher to render individual pupil attention. This is because of the large numbers of pupils in classes as a result of inadequate facilities.

This kind of situation in institutions of learning makes it very difficult for curriculum implementers to carry out their roles effectively. Therefore, absence of teaching-learning resources in schools hamper the teaching and learning process and consequently discourage students from pursuing Physics. Mkandawire (2010) further observed that success and access to education by all learners lied in the curriculum, the pedagogy, the examination and the schools approach. The researcher further suggested that if unseen barriers are taken care of, access to education by all children will not be possible. Mkandewire (2010) contended that if standard officers do not go out to evaluate implementation of the curriculum it will be difficult to know whether the curriculum is being effectively implemented or not.

Onojerena (2015) in a study on role of school managers in curriculum implementation in Nigeria secondary schools observed that no meaningful teaching and learning took place without adequate resource materials. The availability and quality of resource material like text books, charts, models, simulators, laboratories and classrooms had a great influence on curriculum implementation.

Kyule et al., (2016) studied challenges in implementation of secondary school Agriculture curriculum in Kenyan arid and semi arid counties: the students' perspective. The study found out that 63.5% of the schools had inadequate teaching-learning materials including text books. The investigation found out that one text book was being shared by three or four learners. This was noted to hinder effective curriculum implementation. The text book ratio determines adequacy and frequency of use of the learning reference materials hence influencing curriculum implementation. As show on Table 4.6 this study established that 54.00% of schools in Bungoma County had inadequate text books while 14.88% did not have required text books for Physics.

The teachers who participated in this study reported that the inadequate learning materials in schools make Physics uninteresting to learners when teachers re-sought to theoretical approach to teaching. This in the end may lead to low academic performance in Physics hence impacting negatively on Kenya's effort to achieve vision 2030.

Fourthly, this study sought to determine the influence of teaching-leaning activities on the implementation of the Physics curriculum in secondary schools in Bungoma County. Results on Table 4.8 shows that majority of the respondents 56.3% indicated that teaching-learning activities influenced implementation of the Physics curriculum. The Pearson Product-Moment correlation test on Table 4.13 showed that teaching-learning activities influenced implementation of the Physics curriculum by 13.9%. Teaching-learning activities were found to have the second highest influence on implementation of the curriculum among the five factors under investigation in this study.

This finding concurred with findings by Feyera (2014), Esokomi et al., (2016), Kola (2013), Jimoyiannis and Komis (2007) and Buabeng-Andoh (2012). Feyera (2014) studied major factors that affect grade 10 students' academic achievement in science Education in Oromia regional state in Ethiopia. Feyera (2014) found out a 14.03% influence of learning activities on students' academic achievement. Feyera (2014) further noted that effective and multiple approaches of instructional strategies involve knowledge of multiple activity; sequences that lead to successful student learning a specific process. The researcher had observed that laboratory activities were limited in science Education in Ethiopia. The limited activities negatively impact on implementation of curriculum and learners' achievement.

In addition, some schools did not have laboratory rooms or materials which hindered science learning activities. The very low laboratory practices at secondary schools result to ineffectiveness in curriculum implementation and hence low students' academic achievement. Feyera (2014) suggested that in the 21st Century, students have to be comfortable and competent in a complex scientific and technological world. Thus students should take an active role by taking responsibility for their own learning, this is by developing goals for themselves, and asking help when needed.

Further the results of this study agree with findings of Esokomi et al., (2016) in the study on influences of Science Club Activities (SCA) on secondary school students' interest and achievement in Physics. In the study Esokomi et al., (2016) rated SCA in secondary schools to be taking place at only 25.0%. The low SCA were cited as one of the causes of poor achievement in Physics. The researchers found out that the mean of students who participated in SCA was slightly higher at 18.52 as opposed to non-participants mean of 18.20. Esokomi et al., (2016) revealed that SCA stimulated individual input in science and promoted motivation and interest for learners. The learning activities provided a forum to provoke controversy and debate on science issues and occasionally informed conclusions.

Science activities were found to offer opportunity for peer instruction and lead to formation of groups which work on science and engineers fair competition projects. Besides that, learning activities encouraged problem solving by using real situations and by designing and developing projects. Learners develop critical thinking skills and discovery of new scientific concepts. This implies that students' interest in science activities positively influenced curriculum implementation and achievement in Physics.

This implies that the teaching-learning activities have huge effect on the implementation of the curriculum and learners' achievement. This study established that Physics teaching-learning activities in the 21st Century still remains traditionally teacher dominated, yet change in technological world has it that things must change including pedagogical approaches for the Country to be able to achieve the SDGs by the year 2030 .The teacher therefore has a responsibility of ensuring that learning activities in the classroom are in line with goals of Education for sustainable development and for a sustainable society.

Lastly, this study sought to find out the influence of scope and coverage of the syllabus on the implementation of the Physics curriculum in secondary schools in Bungoma County. Findings shown on Table 4.11, showed that majority of the respondents 50.5% indicated that scope of the syllabus influenced the implementation of the curriculum for Physics.

In support of this one of the students had to say "teachers in our school teach at a very fast pace. We cannot understand much; they are after finishing the syllabus as soon as possible". In addition, most of the students reported that most of their teachers had other subjects to teach and responsibilities; therefore they were always in and out of school which reduced learning time. Interestingly, the Pearson Product-Moment correlation test revealed that scope of the syllabus influences implementation of the Physics curriculum by only 1.4%. This research finding indicated that scope and coverage of the syllabus causes the least influence on implementation of the Physics curriculum.

These finding are consistent with findings reported by Semela (2010), shikuku (2010), Cheplogoi (2014) and the World Bank report (2008). Semela (2010) in the study on who is joining Physics and why? "Factors influencing the choice of Physics among Ethiopian university students" the study found out that due to the wide scope of the syllabus, teachers in high school do not cover all important topics in Physics hence negatively influencing the choice for Physics at University. Semela (2010) observed that teachers have a tendency to spend half of the instructional time in one or two topics to the exclusion of others.

These results concur with the findings of Schwartz as cited by Semela (2010) which examined the performance of 8310 college students in introductory Physics, Chemistry and Biology courses in 55 randomly chosen USA universities. The study had observed that students who had reported an in-depth coverage of at least one major topic earned higher grades in college science than those reported to have no in-depth coverage. The findings specifically showed that students who have an extensive study of Physics or Chemistry at high school appeared to have specific advantage.

These study findings confirmed results findings by Shikuku (2012) in the stud on effect of syllabus coverage on secondary students' performance in Mathematics in Kenya. Moreover, Shekuku (2012) observed a positive relationship between syllabus coverage and students performance. The researcher noted that early syllabus coverage in the year allows learners to spend more time on revision.

Cheplogoi (2014) in the study on challenges faced by teachers in implementing agriculture curriculum in Baringo County argues that implementation of curriculum requires sufficient amount of time for preparation. Lack of enough time necessary for planning was one of the barriers to effective curriculum implementation. Cheplogoi (2012) in the study established that limited time to cover the syllabus was coupled with the huge teaching workload for teachers making it difficult in lesson planning and classroom implementation. Syllabus coverage was also affected by the many CATs that were done on regular basis. A teacher has to mark the CATs and enter the marks in the pupils' progress records. Besides these, teachers had many other professional documents to make including schemes of work, lesson plan, pupils' register and other extra activities outside the classroom limit the teachers' time for syllabus coverage. These study findings are consistent with the report by the World Bank (2008). The report said that the scope of the syllabus in secondary education in Sab-Saharan Africa and the allocated time are not proportional to allow effective curriculum implementation.

Furthermore, regression analysis showed that teaching methods, learners' motivation, teaching-learning materials, teaching-learning activities and scope of the syllabus all together influenced implementation of the Physics curriculum by 42.2%. The predictors were found to be significant. The other instructional influences that were not looked at by this study contribute 57.8% influence on implementation of Physics curriculum. This study findings affirmed the assertion by Mkandawire (2010) who noted that effective implementation of curriculum is influenced by many factors including; class population, manpower, government subsidy, learning materials, in-service programs for teachers and learners.

Also in support is the study by Cheplogoi (2014) who also highlighted many other factors challenging implementation of curriculum in secondary schools in Kenya; naming; lack of support by school administration, frequent change in curriculum, too much workload for teachers and too wide content on topics as factors hindering effective curriculum implementation. Based on the findings instructional influences on implementation of Physics curriculum are many and must be addressed in order to achieve the goals of Education in Kenya.

4.8 Chapter Summary

The first objective was to establish the influence of teaching methods on the implementation of the Physics curriculum in secondary schools in Bungoma County. This study established that teaching methods influenced the implementation of the Physics curriculum in secondary schools by 7.6%. Secondly, this study sought to determine the influence of learners' motivation on the implementation of the Physics curriculum in secondary schools in Bungoma County. This study observed a 10.3% influence of learners' motivation on the implementation of the Physics curriculum in secondary schools in Bungoma County. Thirdly, this study sought to find out the influence of teaching and learning materials on the implementation of the Physics curriculum in secondary schools in Bungoma County. The results indicated that teaching-learning materials influence 14.5% implementation of the Physics curriculum in secondary schools.

Fourthly, this study sought to determine the influence of teaching-leaning activities on the implementation of the Physics curriculum in secondary schools in Bungoma County. Results show that teaching-learning activities influenced the implementation of Physics curriculum by 13.9%.

Lastly, this study sought to find out the influence of the scope and coverage of the syllabus on the implementation of the Physics curriculum in secondary schools in Bungoma County. The findings indicated a 1.4% influence of scope and coverage of the syllabus on the implementation of the Physics curriculum in secondary schools. Multiple Regression findings indicated that teaching methods, learners' motivation, teaching-learning materials, teaching-learning activities and scope of the syllabus together influenced implementation of the Physics curriculum by 42.2%.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

In this chapter the findings are summarized, conclusions are made and recommendations postulated. In addition, recommendations for further research are made. This study attempted to answer five major research questions.

First, it set out to establish how teaching methods influenced implementation of Physics curriculum. Secondly, it endeavored to determine the influence of learners' motivation on the implementation of Physics curriculum. Thirdly, it was meant to find out the influence of teaching-learning materials on the implementation of Physics curriculum. Fourthly, this study was meant to determine the influence of teaching-learning activities on the implementation of Physics curriculum. Lastly, this study endeavored to find out the influence of scope of the syllabus on the implementation of Physics curriculum.

5.1 Summary of Study Findings

5.1.1 Influence of teaching methods on the implementation of Physics curriculum in secondary schools

The first objective was to establish the influence of teaching methods on the implementation of Physics curriculum in secondary schools in Bungoma County. The findings indicated that teaching methods influenced implementation of Physics curriculum by 7.6%. This study established that most schools were not using student-centered teaching methods like; Inquiry-Based Teaching, laboratory practical, project, discovery and ICT integration methods. Failure by teachers to use these methods influenced implementation of Physics curriculum.

5.1.2 Influence of learner’s motivation on the implementation of Physics curriculum in secondary schools

The second objective posed in this study was to determine the influence of learners’ motivation on the implementation of Physics curriculum in secondary schools in Bungoma County. The findings indicated that learners’ motivation influenced implementation of Physics curriculum by 10.3%. This study found out that most teachers in schools were not reinforcing and rewarding students in classroom to motivate learners. Career guidance was also lacking in schools and therefore students lacked moral support for motivation towards Physics. Failure to motivate students influenced implementation of Physics curriculum.

5.1.3 Influence of teaching-learning materials on the implementation of Physics curriculum in secondary schools

The third objective in this study was to find out the influence of teaching-learning materials on the implementation of Physics curriculum in secondary schools in Bungoma County. The findings indicated that teaching-learning materials influenced implementation of Physics curriculum by 14.5%. Inadequate teaching-learning materials in schools hindered hands-on and individualized learning. In the absence of learning materials, teachers taught theoretically making implementation of Physics curriculum ineffective.

5.1.4 Influence of teaching-learning activities on the implementation of Physics curriculum in secondary schools

The fourth objective posed in this study was to determine the influence of teaching-leaning activities on the implementation of Physics curriculum in secondary schools in Bungoma County. The findings indicated that teaching-learning activities influenced implementation of Physics curriculum by 13.9%.

Inadequate teaching-learning materials lead to minimal learning activities in classrooms. Due to inadequate learning materials teachers and laboratory assistants carried out demonstration hindering participatory learning. Hence, learning became boring for non-participants. Minimal learning activities did not allow individualized and discovery learning. Most schools had learning activities dominated by question-answer, discussion, problem solving and note taking. These would have influenced implementation of Physics curriculum.

5.1.5 Influence of Scope and coverage of the syllabus on implementation of Physics curriculum in secondary schools

Lastly, this study sought to find out the influence of scope of the syllabus on implementation of Physics curriculum in secondary schools in Bungoma County. Findings indicated that scope of the syllabus influenced implementation of Physics curriculum by 1.4%. It was found out that the syllabus for Physics was too wide. Most teachers did not cover all topics in form One and Two but skipped some topics due to the inadequate time allocated for Physics. The syllabus coverage in most schools was not in-depth and timely. These influenced implementation of Physics curriculum in secondary schools in Bungoma County.

5.2 Conclusions

The following conclusions were made on the basis of the research findings:

1. Teaching methods influenced implementation of Physics curriculum in secondary schools. The use of student-centered teaching methods enhanced curriculum implementation. Students taught through this approaches had better academic achievements than those taught through regular methods.

2. Learners' motivation influenced implementation of Physics curriculum in secondary schools. Rewards motivated learners and made them work had hence achieved superior grades in examinations. Motivation also made students interested to learn more especially at free time which resulted in better academic achievement.

3. Teaching-learning materials influenced implementation of Physics curriculum in secondary schools. Learners with adequate learning materials had better academic achievement compared to those with inadequate learning materials. Learning materials allowed learners to exercise their practical skills and learn through discovery making them motivated.

4. Teaching-learning activities influenced implementation of Physics curriculum in secondary schools. Learning activities promoted research, presentation, problem solving, discussion, participatory learning and the use of student-centered approaches. They also provided learners with room for interpersonal communication and collaborative team-based learning. Since learning activities encourage interaction between students and the concepts being learnt they therefore allow multiple approaches to learning.

5. The scope and coverage of the syllabus influenced implementation of Physics curriculum in secondary schools. A wide scope of the syllabus forced teachers to teach at a fast pace to cover it within the allocated time on the school timetable. This made average and slow learners lack behind. As a result of the wide syllabus most schools never covered the form One and two topics. A wide scope of the syllabus therefore hindered an in-depth and effective coverage of the curriculum.

5.3 Recommendations

In view of the findings and conclusions, the study made the following recommends:

1. Teachers should be provided with in-service education on modern learner-centered teaching methods like; IBT, ICT integration and discovery. Therefore for effective implementation of Physics curriculum, teachers should continue to embrace learner-centered approaches.

2. Teachers should focus more on arousing learner's motivation (intrinsic and extrinsic) in Physics by reinforcing and rewarding students. Career guidance should also be provided. Teachers should therefore ensure they work on students' intrinsic and extrinsic motivation for effective implementation of curriculum.

3. Schools should be furnished with adequate teaching-learning materials for effective implementation of curriculum. Therefore Schools offering Physics have no option but to provide adequate learning materials.

4. Teachers should practice activity-centered or experiential learning for effective implementation of curriculum. Therefore many learning activities have to be arranged by teaches to enhance implementation of curriculum.

5. Curriculum developers should systematically consult with the teachers so as to holistically revise the overloaded Physics curriculum in order to improve curriculum implementation. It is therefore crucial that the scope of the syllabus for Physics is reviewed to fit into the allocated or available time.

5.4 Suggestion for Further Research

The following recommendations for further research were made:

1. Studies involving lager sample size in terms of participating Counties, schools, teachers and students to confirm whether the present findings hold or not.
2. Further research is needed to explore other factors like; students' KCPE entry mark, teachers competence, peer influence, family back ground and type of school on implementation of Physics secondary schools in Kenya.

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APPENDICES

Appendix I: Teachers' Questionnaire (TQ)

Introduction

You have been specially selected to participate in the study about instructional influences on implementation of the physics curriculum in secondary schools in Bungoma County, Kenya. Your contributions will help much towards the success of the study and will be treated with the highest level of confidentiality. Please do not write your name on this questionnaire, all responses are anonymous. Please put a tick (√) in the appropriate box to the right that best describe your response.

A: Background information

A1. Please indicate your gender: Male ☐ Female ☐

A2. What is your present age? Under 30yrs ☐ 31-40yrs ☐ 41-50yrs ☐ Over 50yrs ☐

A3. Which is your highest academic qualification? Diploma ☐ Bachelors ☐ Masters ☐

PhD ☐ other ☐

A4. For how long have you been teaching Physics? 0-5yrs ☐ 6-10yrs ☐ 11-15yrs ☐

Over 16yrs ☐

A5. What has been your school average performance in Physics at KCSE for the last 3years? Mean score ☐ Mean grade ☐

B: How often do you use the following teaching methods in teaching Physics?

B:Teaching method	Very often	Often	Rarely	Never
B1. Inquiry- Based-Teaching method				
B2. Laboratory practical method				
B3. Project method				
B4. Discovery method				
B5. ICT integration method				
B6. Mastery learning method				
B7. Lecture method				
B8. Discussion method				
B9. Question-Answer method				
B10.Problem-Solving method				
B11. Demonstration method				

C: Rate the following statements to indicate learners' motivation in Physics

C: Learners' motivation statement	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
C1. Most students in my school do excellently in Physics					
C2. In my school we give rewards to best performers in Physics					
C3. Most of my students like Physics					

D: Indicate in the table the level of availability of the following teaching-learning materials for Physics in your school.

D: Teaching-Learning materials (Resources)	**Available and adequate**	**Available and Not adequate**	**Not Available**
Physics text books			
Meter rules			
Mirrors			
Lenses			
Microscopes			
Ammeter			
Voltmeter			
Thermometer			
Stop watch			
Bunsen burner/ sources of heat			
Dry cells			
Bulbs/ sources of light			
Smoke cell			
Vacuum flask			

E: Rate the following learning activities in the teaching of Physics to show frequency of use

E:Teaching-learning activities	Very frequently	Frequently	Rarely	Never
E1. I teach Physics by use of group discussions				
E2. I teach Physics by use of simulations				
E3. I teach Physics by use of problems- solving				

F: Rate the following statements on scope and coverage of Physics curriculum in you school.

F: Scope and coverage of the Syllabus	Strongly agree	Agree	Undecided	Disagree	Strongly disagree
F1**.** The Physics syllabus is too wide to be covered within the available time					
F2. The time allocated for Physics is adequate to cover the planned objectives					
F3**.**The work lord affects the coverage of the Physics syllabus					
F4**.** The Physics syllabus is too wide that I have to teach in a fast pace for coverage					
F5. I never completed the form One and Two Physics topics at the end of each year respectively					

G: Open-ended question

G1. What do you think are the major influences on the implementation of the Physics curriculum in your school?

G2. What do you think should be done in order to manage these influences on the implementation of the Physics curriculum in your school?

THANK YOU FOR ACCEPTING TO GIVE THE INFORMATION!!!!

Appendix II: Students' Questionnaire (SQ)

Introduction

You have been specially selected to participate in the study about instructional influences on the implementation of Physics curriculum in secondary schools in Bungoma County, Kenya. Your contributions will help much towards the success of the study and will be treated with the highest level of confidentiality. Please do not write your name on this questionnaire; all responses are anonymous.

Please tick (√) in the appropriate box against the number that best describe your response to the question.

A: Background information

A1. Please indicate your gender. Male ☐ Female ☐

A2. What is your present class? ---------

A3. What was your previous performance in physics? ----------- %

B: How often are the following teaching methods used in Physics?

B:Teaching methods	**Very often**	**Often**	**Rarely**	**Never**
B1. Inquiry- Based-Teaching method				
B2. Laboratory practical experiments				
B3. Project work method				
B4. Discovery method				
B5. ICT integration method; e.g. use of computer				
B6. Mastery learning method				
B7. Lecture method; eg teacher talking in class				
B8. Discussion method				
B9. Questions answer method				
B10. Problem solving method				
B11. Demonstration method				

C: Rate the following statements to indicate your motivation in Physics

C: Motivation statement	Strongly agree	Agree	Undecided	Disagree	Strongly disagree
C1. I do excellently in Physics					
C2. I always get rewarded for good performance in Physics					
C3. I enjoy Physics lessons					
C4. I Love revising Physics topics during my free time					

D: Indicate in the table the level of availability of the following teaching-learning materials for physics in your school.

Resource/ material	Available and adequate	Available and Not adequate	Not Available
Physics text books			
Meter rules			
Mirrors			
Lenses			
Microscopes			
Ammeter			
Voltmeter			
Thermometer			
Stop watch			
Bunsen burner/ sources of heat			
Dry cells			
Bulbs/ sources of light			
Smoke cell			
Vacuum flask			

E: Rate the following statements to reflect on learning activities in Physics instruction

E. Learning activities in physics	Very frequently	Frequently	Rarely	Never
E1. I learn Physics through group discussion				
E2. I learn Physics through simulations				
E3. I learn Physics through problem solving				

F: Rate the following statements on scope and coverage of Physics curriculum in your school

F: Scope and coverage of Syllabus	Strongly agree	Agree	Undecided	Disagree	Strongly disagree
F1. The Physics syllabus is too wide to be covered within the available time					
F2. The time allocated for physics is adequate to cover the planned topics					
F3. The work load affects the coverage of the Physics syllabus					
F4. The Physics syllabus is too wide that our teacher teaches at a fast pace for coverage					
F5. I never completed the Form One and Two Physics topics at the end of each year respectively					

G: Open-ended question

G1. What do you think are the major influences on the implementation of the Physics curriculum in your school?

G2. What do you think should be done in order to manage these influences on implementation of Physics curriculum in your school?

THANK YOU FOR ACCEPTING TO GIVE THE INFORMATION!!!!!

Appendix III: Lesson Observation Schedule (LOS)

School:----------- Class:-------Time----------

Roll: Boys ------- Girls ------- Subject-----------

(A) Introduction

(i) Teaching methods used:---

(ii) Learners motivations:---

(iii)Materials used:---

(iv)Learning activities:---

(B)Lesson Development

(i)Teaching methods used:--

(ii) Learners motivations:---

(iii) Materials used:--

(iv)Learning activities:---

(C) Conclusion

(i) Teaching methods used:---

(ii) Learners motivations:---

(iii) Materials used:--

(iv)Learning activities:---

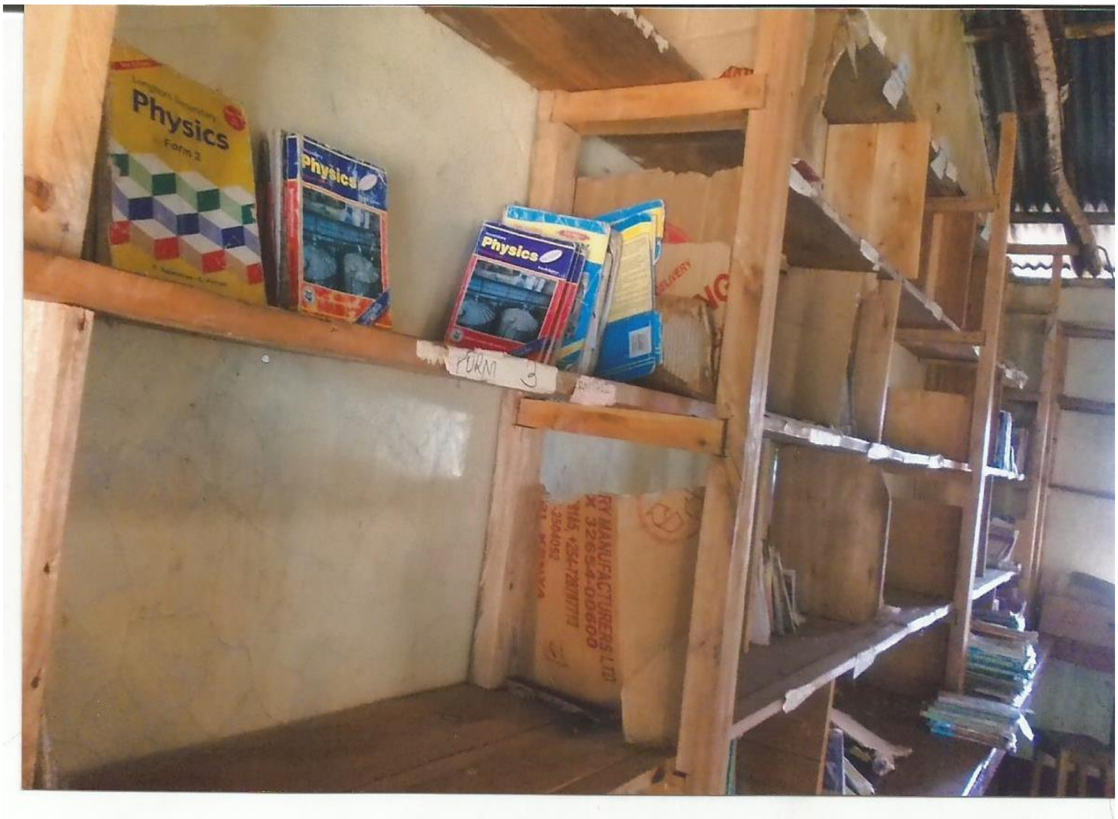
Appendix IV: Observation Checklist (OC)

Physics materials/Resources	Available and adequate	Available and Not adequate	Not Available
Physics text books			
Meter rules			
Mirrors			
Lenses			
Microscopes			
Ammeter			
Voltmeter			
Thermometer			
Stop watch			
Bunsen burner/ sources of heat			
Dry cells			
Bulbs/ sources of light			
Smoke cell			
Vacuum flask			

Appendix V: Form three Students in a laboratory

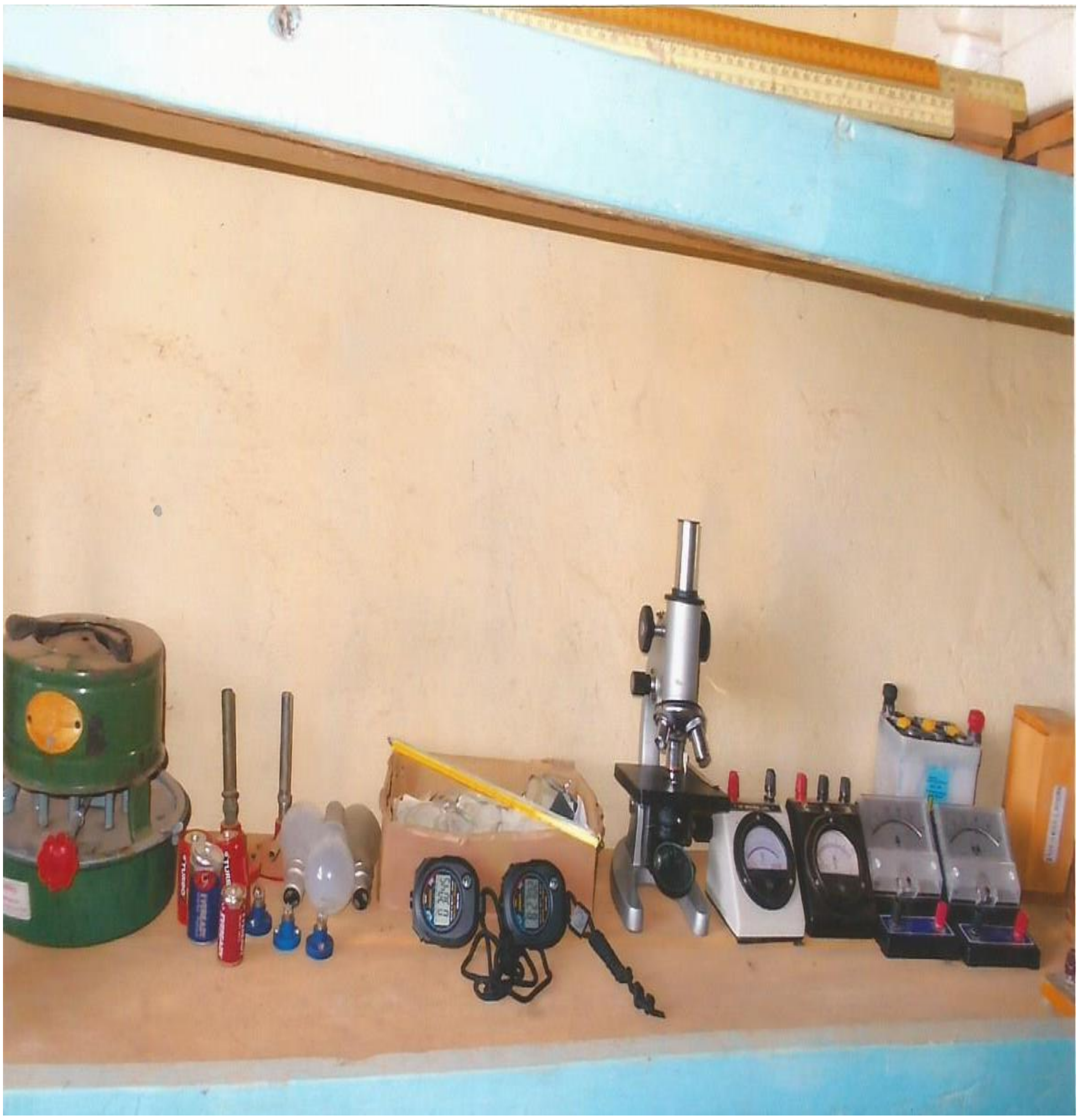
Learners in an overcrowded laboratory which does not allow individual practical activities

Appendix VI: A section of books in a school library



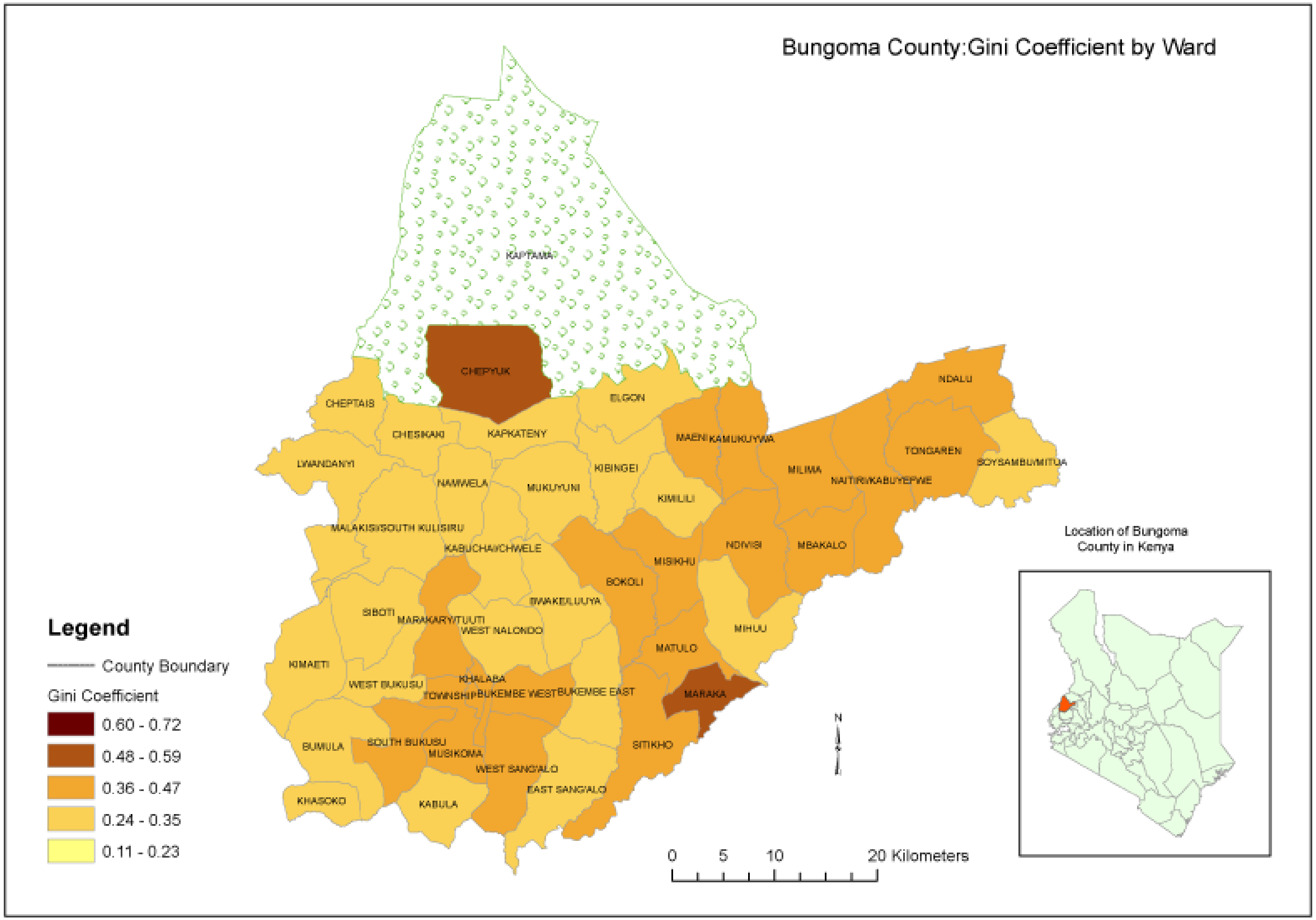
Almost empty Physics shelves in the library a sign of inadequate textbooks

Appendix VII: Some of the Physics learning materials in the laboratory



Most of these basic Physics learning materials are inadequate in schools

Appendix VIII: A Map of Bungoma County



Appendix IX: Letter of Introduction

Box 86, 50206,
Bokoli-Bungoma.
Tel No: 0720429085

To
The principal,
………………. Sec school,
Box………..,
…………………………

Dear Sir/ Madam,

RE: PERMISSION TO CONDUCT RESEARCH IN YOUR SCHOOL

I Mr. Wafula Edward, a student at Moi University doing a research study on instructional influences on the implementation of the curriculum for Physics for secondary schools in Bungoma County. The study will mainly focus on teaching methods, learners' motivation, teaching-learning materials, teaching learning activities and scope and coverage of the syllabus. The target population of the study is Physics Heads of Subject (HOS) and Form three students of Physics.

I therefore request for your permission to conduct the research in your institution in the mouth of September and October, 2017. I will highly appreciate the offer.

Yours faithfully,

Wafula Edward Nyongesa.

Appendix X: Research Permit

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

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/16/98053/13334

Date: 7th September, 2016

Wafula Edward Nyongesa
Moi University
P.O. Box 3900-30100
ELDORET.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on *"Instructional influences on the implementation of physics curriculum for secondary schools in Kenya,"* I am pleased to inform you that you have been authorized to undertake research in **Bungoma County** for the period ending **6th September, 2017.**

You are advised to report **the County Commissioner and the County Director of Education, Bungoma 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.

BONIFACE WANYAMA
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner
Bungoma County.

The County Director of Education
Bungoma County.

National Commission for Science, Technology And Innovation Is ISO 9001:2008 Certified

Appendix XI: Research Permit (Bungoma County)

REPUBLIC OF KENYA

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY
State Department of Education – Bungoma County

When Replying please quote
e-mail: bungomacde@gmail.com

Ref No: BCE/DE/19 VOL I/228

County Director of Education
P.O. Box 1620-50200
BUNGOMA
Dates: 13th September, 2016

The County Director of Education
BUNGOMA COUNTY

RE: AUTHORITY TO CARRY OUT RESEARCH – WAFULA EDWARD NYONGESA: REF: NO. NACOSTI/P/16/98053/13334

The bearer of this letter Wafula Edward Nyongesa is a Post graduate student pursuing a PhD Degree at Moi University. He has been authorized to carry out research on "***Instructional influences on the implementation of physics curriculum of physics curriculum for secondary schools in Kenya,***". Kindly accord him the necessary assistance.

CHRISTINE OWINO
FOR: COUNTY DIRECTOR OF EDUCATION
BUNGOMA COUNTY

Appendix XII: Research Authorisation (County Commissioner Bugoma)

REPUBLIC OF KENYA

THE PRESIDENCY
MINISTRY OF INTERIOR AND COORDINATION OF NATIONAL GOVERNMENT

Telephone: 055- 30326
FAX: 055-30326
E-mail: ccbungoma@yahoo.com
When replying please Quote

Office of the County Commissioner
P.O. Box 550 - 50200
BUNGOMA

13th September, 2015

REF: ADM.15/13/268

TO WHOM IT MAY CONCERN

RE: RESEARCH AUTHORIZATION

The bearer of this letter Mr. Wafula Edward Nyongesa is a student of Moi University and has sought authority to carry out a research on, **"Instructional influences on the implementation of physics curriculum for secondary schools in Kenya,"** of this County for the period ending on 6th September, 2017.

Authority is hereby granted for the specific period and any assistance accorded to him in this pursuit would be highly appreciated

COUNTY COMMISSIONER
BUNGOMA

G.W. Khaemba
For County Commissioner
BUNGOMA COUNTY

Appendix XIII: Research Permit (NACOSTI)

CONDITIONS

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

REPUBLIC OF KENYA

NACOSTI

National Commission for Science, Technology and Innovation

RESEACH CLEARANCE PERMIT

Serial No.A 10862

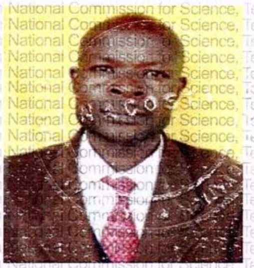
CONDITIONS: see back page

THIS IS TO CERTIFY THAT:
MR. WAFULA EDWARD NYONGESA
of MOI UNIVERSITY, 86-50206 BUNGOMA,has been permitted to conduct research in *Bungoma County*

on the topic: *INSTRUCTIONAL INFLUENCES ON THE IMPLEMENTATION OF PHYSICS CURRICULUM FOR SECONDARY SCHOOLS IN KENYA*

for the period ending:
6th September,2017

Permit No : NACOSTI/P/16/98053/13334
Date Of Issue : 7th September,2016
Fee Recieved :Ksh 2000



....
Applicant's Signature

....
Director General
National Commission for Science, Technology & Innovation