USE OF COMPUTER SIMULATION INSTRUCTIONAL PACKAGES IN ENHANCING THE TEACHING OF PHYSICS: A STUDY OF SECONDARY SCHOOLS IN UASIN GISHU COUNTY−KENYA

BY

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DECLARATION

Declaration by Candidate

This thesis is my original work and has not been presented for a degree in any other University or Institution of higher learning. No part of this work may be reproduced without prior permission of the author and/or Moi University.

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DEDICATION

This thesis is dedicated to my immediate family: my wife Miriam Sum, and my two children, Joy Jemutai and Caleb Kiplagat. I acknowledge the encouragement offered during the period of my studies. I also dedicate this thesis to my beloved parents, brothers, sisters and friends for their moral and spiritual support.

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ABSTRACT

Physics is an important subject in Kenya's secondary school curriculum because of its role in the society and if taught effectively can propel the country's development goals as envisaged in the vision 2030. Empirical studies world over has underscored the important role of computer simulations as an instruction resource in enhancing teaching in schools. The purpose of this study was to investigate the use of computer simulation instructional packages in enhancing the teaching of physics in Uasin Gishu County secondary schools. The specific objectives of this study were: to find out the availability of computer simulation instructional packages, examine how physics teachers use computer simulation instructional packages, explore the attitudes of physics teachers towards the use of computer simulation instructional packages, determine the nature of technical support physics teachers get in the use of computer simulation instructional packages, and to identify the challenges teachers face in using computer simulation instructional packages. This study was guided by the Constructivist learning theory; used descriptive survey design, and adopted mixed method approach. The target population included all the 210 secondary schools in Uasin Gishu County. Purposive sampling method was used to select 30 secondary schools while both purposive and simple random sampling methods were used to select 60 physics teachers, 30 heads of physics and 30 laboratory assistants. Data collection instruments used included the questionnaire, checklist, interview and observation schedules. Quantitative data was analyzed using descriptive statistics while qualitative data was analyzed thematically and presented inform of verbatim quotations**.** The findings on computer simulation instructional packages in secondary schools were: Availability 44.5% , usage 43.2%, 65.4% of physics teachers depicted a positive attitude towards the use, 53.2% of physics teachers lacked technical support, and 70.2% of schools had challenges on internet connectivity and 57.4% lacked trained laboratory assistants. The study findings on physics teachers feelings on use of computer simulation instructional packages were: viewed by majority of teachers that the resource was inadequate, majority of teachers hold that they were not supported by laboratory assistants as required, majority of teachers agreed that schools lack internet services and training for laboratory assistants. The study concludes that majority of secondary schools had a limited use on computer simulation instructional packages in enhancing and teaching of physics. This study recommended the following: that school's Board of Management should finance the provision of computer simulation instructional packages and internet resources promote and strengthen teachers on the use computer simulation instructional packages and lastly empowerment of laboratory assistants through in-service training.

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ABBREVIATIONS AND ACRONYMS

CAI	Computer Assisted Instruction
CAL	Computer Assisted Learning
CAT	Computer Assisted Teaching
CDF	Constituency Development Fund
CEMASTEA	Center for Mathematics Science and Technology Education in Africa
CSIP	Computer Simulation Instructional Packages
DVD	Digital Versatile Disc
ESP	Economic Stimulus Program
FADCTA	Flemish Association for Development Cooperation and Technical Assistance
GoK	Government of Kenya
HOP	Heads of physis
ICT	Information and Communication Technologies
KCSE	Kenya Certificate of Secondary Education
KICD	Kenya Institute of Curriculum Development
MOE	Ministry of Education
PhET	Physics Education Technology
SMASSE	Strengthening of Mathematics and Science in Secondary Education
SPSS	Statistical Package for social Science
STI	Science Technology and Innovation

CHAPTER ONE

INTRODUCTION TO THE STUDY

1.0 Introduction

This chapter introduces the background information of the study, statement of the problem, purpose of the study, research objectives and research questions. The presents the justification and significance to the study, scope and limitations of the study, assumptions of the study, theoretical framework and conceptual framework of the study.

1.1 Background to the Study

Kenya targets to revolutionize itself into a rapidly industrialized middle level income economy as envisaged in vision 2030 strategy (Awino, & Kithinji, 2012). Kenya's Vision 2030 acknowledges the importance of Science, Technology and Innovation in the current economy where innovative information is critical to its growth. The contribution by Scientists and Technologists reveals that benefits from sciences to the society are enormous (Adeyemo & Babajide, 2014). Science and specifically physics is considered essential for the growth of economic wellbeing of a nation (Adeyemo & Babajide, 2014). The main sciences taught in Kenyan secondary school curriculum includes physics, chemistry and biology. Physics is defined as the behavior of matter in relation to energy. Lissauer & De Pater (2013) underscores physics as an important science subject because it assists in the understanding of the rest of the sciences. This suggests that other sciences heavily depend on the physics subject (Campbell, 2013). When physics is poorly performed, often times concerns arise from stakeholders especially researchers with the aim of finding out the root causes and searching formidable for solutions. This study was geared to find out the use of computer simulation instructional packages (CSIP) in enhancing the teaching of physics in secondary schools. The 21st century research with the technological inventions has shown that the use of CSIP as a teaching tool by teachers would enhance classroom teaching. Smetana & Bell (2012) defined CSIP as dynamic models created by computers to provide simplified or theoretical representations of real-world components, occurrences and processes. The use of CSIP creates interactive, authentic and meaningful teaching processes possible between teachers and students (Van Lier, 2014). The study findings by Fox, (2016) showed the effective use of CSIP in science classrooms setup is varied, abundant and dependant on the user's desire. According to these studies, learners taught using CSIP would explore, observe, and receive rapid feedback regarding actual things and occurrences that would otherwise be difficult to understand. Physics is a science that bases its success on how it is presented, being an experimental subject, it requires extra attention both to theory and practice. There have been efforts by professionals to find out the solutions to the perceived difficulty in learning physics concepts. The teaching of physics using CSIP would be made easier and will help to avoid unnecessary misconceptions of the subject's content. Atabhotor & Kofoworola (2020) showed that learners can use CSIP to work with real data, develop and test many hypotheses on their own. Research studies recommend the use of CSIP in teaching physics in secondary schools. This study sought to find out the availability of computer simulation instructional packages CSIP in the various schools sampled, examine how physics teachers use these packages to enhance teaching and learning, establish the attitudes of physics teachers towards the use of computer simulation instructional packages, determine the nature of technical support physics teachers get in the use of computer simulation instructional packages, and identify the challenges teachers face in using computer simulation instructional packages.

All over the world, for instance in the United States of America, CSIP is considered to improve school academic achievements compared to schools teaching without using CSIP (Merchant et al., 2014). Use of CSIP in teaching involves a one-on-one interactions, multimedia capabilities that enrich the lesson presentations, self-pacing and instantaneous feedback (Arkorfu, & Abaidoo, 2015). He further illustrated that use of CSIP has a positive effects on attitudes' and achievements on both students and teachers. In Europe, CSIP is considered as an excellent instructional tool in improving students' understanding in science subjects more specifically physics (Azevedo, 2018). The study by Gambari et al., (2016) showed that using CSIP in teaching physics, chemistry and biology in Turkey has a positive impact on students' academic performance. The development of computer assisted instruction (CAI) for science teaching in India showed that the use of CAI is beneficial to student learning because it leads to improved academic achievements (Vasant, 2016).

In Africa, research shows that the effects of computer assisted learning (CAL) on mathematics performance in Nigerian secondary school students who used CAL had better results than their counterparts (Ugwuanyi & Okeke**,** 2020). Research by Kareem (2015) looked into the impact of computer assisted instruction (CAI) on students' biology performance in Nigerian secondary schools. The findings of study showed that students exposed to CAI had better results than their counterparts. Based on these findings, it was recommended that the use of CAI be integrated in teaching biology in Nigerian secondary schools.

In Kenya, several interventions on improving learner's performance were put in place that included in-servicing training for science teachers through strengthening of mathematics and science in secondary education programme (SMASSE).

Mathematics and physics teachers in secondary schools play essential roles in student's academic performance. It was found necessary that teachers are empowered with knowledge and skills in computer through in- service training. Further, information communication and technology (ICT) integration center (Kenya science campus) of University of Nairobi, was established with assistance of Flemish Association for Development Cooperation and Technical Assistance (FADCTA) to train science teachers with the knowledge of ICT (Wakhaya, 2010). A center in Nairobi University, Mathematics, Science, and Technology Education in Africa (CEMASTEA), was also tasked to offer training in ICT integration.

In an effort by MoE to achieve on its academic objectives in improving on schools' academic achievements, various interventions on teaching methods have been explored in Kenya (Muricho & Chang'ach, 2013). In an accomplishment test, the impact of ICT integration on mathematics performance in public secondary schools in Embu North revealed that the learners using ICT did better than their counterparts (Gachinu, 2014). Study according to Ronoh, (2014) on the impacts of computer-based learning outcomes on learner's achievements and motivation in biology, the use of computer based instruction was identified as the best strategy to overcome problems of poor academic achievement. According to Bakaç, Tasolu, & Akbay, (2011), CSIP has a beneficial and impacted on students' performance and perspectives. This study sought to find out the use CSIP in teaching physics in secondary schools in Uasin Gishu County.

The government of Kenyan (GoK) came up with an economic stimulus program (ESP) to promote an affordable ICT infrastructure in selected secondary schools in each Sub-County (Njoroge, Ngugi, & Kinzi, 2017). ESP was government's strategy tasked to promote economic and social growth as envisaged in vision 2030. Kenya Institute of Curriculum Development (KICD), through the Ministry of Education (MoE) was tasked with the production of CSIP teaching resources to be used in teachings of sciences in secondary schools (Gachinu, 2014). The resources produced are packaged and sold in digital versatile discs (DVDs) storage devices. These are computer instructional models that form a reflection of a real world in virtual environment. The purpose of simulation is to shed the underlying mechanisms that control the behavior of a system. The teaching done using CSIP resource would be beneficial by exposing students to a high level thinking and generation of new ideas. This study was designed to question the availability of these packages, their use, attitudes related to their use and challenges involved.

In spite of the role of physics to industrialization, the subject has been performing poorly in Kenya certificate of secondary schools (KCSE) examinations (Langat, 2018). Njoroge, Changeiywo & Ndirangu (2014) revealed that many students consider physics to be difficult subject as portrayed in Kenya national examination council (KNEC) results. Getuno et al, (2015) showed that learners with negative attitudes in physics are more likely to surrender pursuing science related careers resulting to scoring poorly in examinations. The attention given to physics as a subject is worrying to education stake holders. There is therefore need to find teaching solutions to improve students' academic performance with the interventions from the education sector. The use of CSIP was tasked to improve student's achievements in physics and those students interested in pursuing physics related careers (Bayne & Jinks, 2013). The records as provided in table1.1 below shows student's achievement in physics in KCSE in Uasin Gishu County.

Table 1.1: Distribution of Physics Performance in KCSE (mean rating out of 12)

Sub County	Soy	Kapseret	Ainabkoi	Moiben	Kesses	Turbo
Year (2016)	4.06	3.50	4.68	3.23	3.99	4.10
Year (2017)	4.25	3.35	4.06	4.01	3.08	3.38
Year (2018)	4.34	3.80	4.48	3.64	3.74	3.25
Year (2019)	4.44	3.64	4.36	4.24	3.35	3.48

Source: County Director of Education

Table 1.1 shows performance by the students who sat for KCSE physics in six Sub County Secondary Schools in Uasin Gishu County, depicts results for the period between 2016 and 2019. The results showed the mean score of grade 4 (D+). This study expects that learning physics would play a major role in propelling technological advancement in the future. The dismal performance of physics, according to Karue & Amukowa (2013), could be attributed to teachers, student factors and inadequate instructional materials. Poor achievement in physics could be attributed to; students attitudes towards physics, teachers attitude towards students abilities in physics (Njoroge, Changeiywo & Ndirangu, 2014), limited learning and teaching resources (Makori & Onderi, 2014). Elton (2010) showed that CSIP prepare physics teachers to confront with the basic knowledge and expound on the concepts that seemed not to be clear to students.

The current study sought to find out the use of CSIP in enhancing the teaching of physics in secondary schools in Uasin Gishu County. According to Hussain, Azeem & Shakoor, (2011) lectures made without the support of CSIP failed to achieve on the desired results in teaching physics considering the fact that physics to be better understood requires more of experimentation, observation and learner hands on participation**.** Lecturing, a teaching method that is commonly reported to be in use in schools especially those with inadequate laboratory resourse (Gachinu, 2014), is an oral presentation of information about a particular subject (Aruna & Thenmozhi, 2014). This methodology is ineffective in enhancing learning and could lead to student's failure to conceptualize, loss of interest, reduce participation thus lead to poor performance in examinations. This study believes that the negative effects of students' academic achievements would be sorted out by effective use of CSIP as a tool of instruction.

1.2 Statement of the Problem

Ministry of Education in Kenya strategized to improve on the standard of secondary education by approving a number of interventions through coordinating and developing school curriculum delivery proceses. The Kenyan government (GoK) came up with an economic stimulus program (ESP) to promote an affordable ICT infrastructure to boost academic achievements in selected secondary schools (Njoroge, Ngugi, & Kinzi, 2017). The intention of ESP was a strategy tasked to promote Kenya's economic and development growth as envisaged by Kenya's vision 2030.

Physics education immensely contributes towards the achievement in economic and development goals as envisaged in Kenya's vision 2030. In spite of the significance of physics role in revolutionalizing the country's economy, its results in the KNEC have been dismally performed**.** According to Chumba, Matere & Kapkiai (2021), Kenyan secondary schools have overstretched teaching resources due to the GoK policy on compulsory 100% primary to secondary transition. Majority of schools in Kenya are found in Sub-Counties and lack the necessary laboratory resources to promote meaningful learning. The current study was tasked to establish the use of CSIP as instructional tool to enhance the teaching of physics to improve on its performance. The KNEC results for four consecutive years in six Sub-County schools in Uasin Gishu County fall below average as analyst in table 1.1 above. This trend is worrying to the students, teachers, schools managers, professionals and other stake holders. The poor academic achievement in physics could be attributed to; student's and physics teacher's attitudes, teaching resources and methodologies.

It is evident world all over that the use of CSIP play a major role in enhancing student's academic achievements in physics, there is therefore exist is information gap in Uasin Gishu County and this poses a challenge in academic excellence to students, teachers, principals and other stake holders. This current study sought to investigate the use of CSIP in enhancing the teaching of physics in secondary schools in Uasin Gishu, Kenya.

1.3 The Purpose of the Study

The purpose of this study was to find out the use of computer simulation instructional packages in enhancing the teaching of physics in secondary schools in Uasin Gishu County.

1.4 Research Objectives

The study was guided by the following research objectives:

i. To find out the availability of CSIP for use in enhancing the teaching of physics in secondary schools.

ii. To examine how physics teachers use CSIP in enhancing the teaching of physics in secondary schools.

iii. To assess the attitudes of physics teachers towards the use of CSIP in enhancing the teaching of physics in secondary schools.

iv. To determine the nature of technical support physics teachers get in the use of CSIP in enhancing the teaching of physics in secondary schools.

v. To identify the challenges teachers face in using CSIP in enhancing the teaching of physics in secondary schools.

1.5 Research Questions

The following research questions guided the study;

i. Are CSIP available for use in enhancing the teaching of physics in secondary schools?

ii. How do physics teachers use CSIP in enhancing the teaching of physics in secondary schools?

iii. What are the attitude of physics teachers towards the use of CSIP in enhancing the teaching of physics in secondary schools?

iv. What is the nature of technical support physics teachers get in the use of CSIP in enhancing the teaching of physics in secondary schools?

v. What are the challenges physics teacher's faces in using CSIP in enhancing the teaching of physics in secondary schools?

1.6 Justification of the Study

Schram (2014) states that justification of the study is an explanation why the study is being conducted. It is evident world all over that the use of CSIP plays a major role in enhancing student's academic achievements in physics, there exist an information gap in Uasin Gishu County and this study sought to find out on the use CSIP in enhancing the teaching of physics use in Uasin Gishu County. Farhan et al., (2019) revealed that the use of CSIP is increasingly being used in scientific classrooms as a result of technological advancements. Use of CSIP has been demonstrated to improve learners' academic performance in schools (Papanastasiou, Drigas & Skianis, 2017). MoE through KICD developed physics curriculum with digital CSIP component integrated, available with an affordable fee to teach both physics theory and practical. The Kenyan gorverment education policy on compulsory primary to secondary transistion, secondary schools have suffered on overstretched teaching resources (Chambal, Matere & Kapkiai, 2021). The outcome on the overcrowded populated classes resulted on diminished laboratory eqiupment that has negatively affected the general physics performance in KCSE examinations in the County

1.7 Significance to the Study

According to Bundgaard & Nielsen (2011) significance of the study outlines the importance of the issue at hand. This research study was to find out on the use of CSIP in enhancing the teaching of physics in secondary schools. The findings of this study will provide MoE policy makers with the insight information on the availability of CSIP resources in enhancing the teaching of physics in secondary schools. It will also provide information on the resource usage in secondary schools. It will further inform the MoE and the stakeholder's assessment on the teachers' attitudes towards the use of the CSIP resource. The findings will also inform on the nature of technical support teachers get as they use CSIP resource in teaching physics. Lastly, the findings will inform the stakeholders on the challenges teachers get when they use CSIP resources.

1.8 Scope and Limitation of the Study

This section provides the information on the scope and the limitation of the study.

1.8.1 Scope of the Study

Simon & Goes (2013) defines the purpose of the scope of the study as parameters under which it operates. The scope indicates the limits in terms of subject and geographical lay out. The study covered all secondary schools in Uasin Gishu County. Descriptive survey design was used to target 30 secondary schools that included 60 physics teachers, 30 heads of physics and 30 laboratory assistants. The research instruments were: the questionnaires, the interview schedules, observational schedules and checklist. The purpose of this study tasked to find out the use of CSIP in enhancing the teaching of physics in secondary schools in Uasin Gishu County.

1.8.2 Limitations of the Study

Limitation of the study refers to challenges anticipated by the researcher (Dufour et al., 2013). According to Simon and Goes (2013), informed that there are two types of limitations: researcher limitations and methodological limitations. Sample size, data collection instruments, and incomplete prior studies in the research area are all examples of methodological limitations. The researcher's limitations include the researcher's prejudice, restricted access to data, and time limits (ibid). The limitations of this study include the following:

i. The study was limited to secondary schools Uasin Gishu County; therefore could not be generalized to cover the entire schools in country.

ii. This research study was limited to the physics teachers, HoPs and laboratory assistants in Uasin Gishu County. The physics teachers that were observed on a live classroom lesson using CSIP were limited to form two class.

iii. The researcher was limited by the relevant literature covered on this study "the use of CSIP in enhancing the teaching of physics in secondary schools".

1.9 Assumptions of the Study

According to simon and Goes (2018) assumptions are those things in a study that are somewhat out of control of the researcher and instead are taken for granted. That is, statements by the researcher that certain elements of the understood to be true.

The study made the following assumptions:

i. The physics teachers were assumed have been fully aware of the concept on the use of CSIP in enhancing the teaching of physics in secondary schools and were also conversant with dynamics of their teaching environments.
ii. The respondents were assumed to have understood the research topic on the use of CSIP in enhancing the teaching of physics in secondary schools and were able to give their responses without difficulty.
iii. The respondents were assumed to have gaven honest insights in line to the current study as regards to the use of CSIP in enhancing the teaching of physics in secondary schools.

1.10 Theoretical Framework

This study was guided by the constructivist learning theory by Jean Piaget (1896-1980) which states that learners construct new meanings and understanding by integrating with new information gained from past experiences. This theory intended to improve on a situation where students relay entirely on teachers' information and accepting it as the truth. The constructivist learning theory supports students that are exposed to primary source who freely interact with each other gaining new knowledge by sharing their experiences. The theory holds that individuals actively generate or create an understanding of reality that is influenced by their experiences (Bada & Olusegun, 2015). According to Keengwe, Onchwari & Agamba (2014), constructivism is often connected with educational techniques that promote active learning, or learning by doing. A study by Kivunja (2014), revealed that learners build meaning only through active participation in tests or real-world problem handling. He further pointed out that knowledge is socially produced and that community plays a key role in "creating meaning". The findings of the study reveals that the environment in which individuals grow influences thier perception toward the meaning of life issues.

At secondary school environment the process of educating learners; teachers plays significant roles of addressing all the learners concerns such as facilitating quality teaching, carrying out evaluation and giving feedback. This means that at school level, for a teacher to produce well refined learners, their concerns must be addressed. Constructivist learning theory therefore views a school as a system with three main components such as; learners as (inputs), the main process as (educating learners) and output as (end products). The main process as (educating learners) ,the teacher plays a role of an instructor assisting learners using the available CSIP resources to: asses, clarify and build from prior the knowledge; facilitate social environment through activities that interconnect ideas and vary approaches to knowledge; and invite students to reflect on the knowledge they acquired. The end products should be individuals (learners) possessing knowledge, attitudes and skills. The output in this case should be educated individuals who are well adjusted and ready to satisfy the needs of the society.

1.11 Conceptual Framework

Conceptual frameswork is a written or visual representation of an expected relationship between variables (Quintana et al. 2018). This framework enumerates characteristics that connect to a study's presenting independent and dependent variables (Evans et al., 2017). The conceptual framework comprises of the following variables; the independent variable were: availability of CSIP for teaching physics, use of CSIP by physics teachers, attitudes of CSIP by physics teachers towards teaching of physics, nature of technical support teachers get; the dependent variable are: enhancement of teaching; the intervening variables were: government policy and development partners. The conceptual framework in figure 1.1 is specifically related to the study.

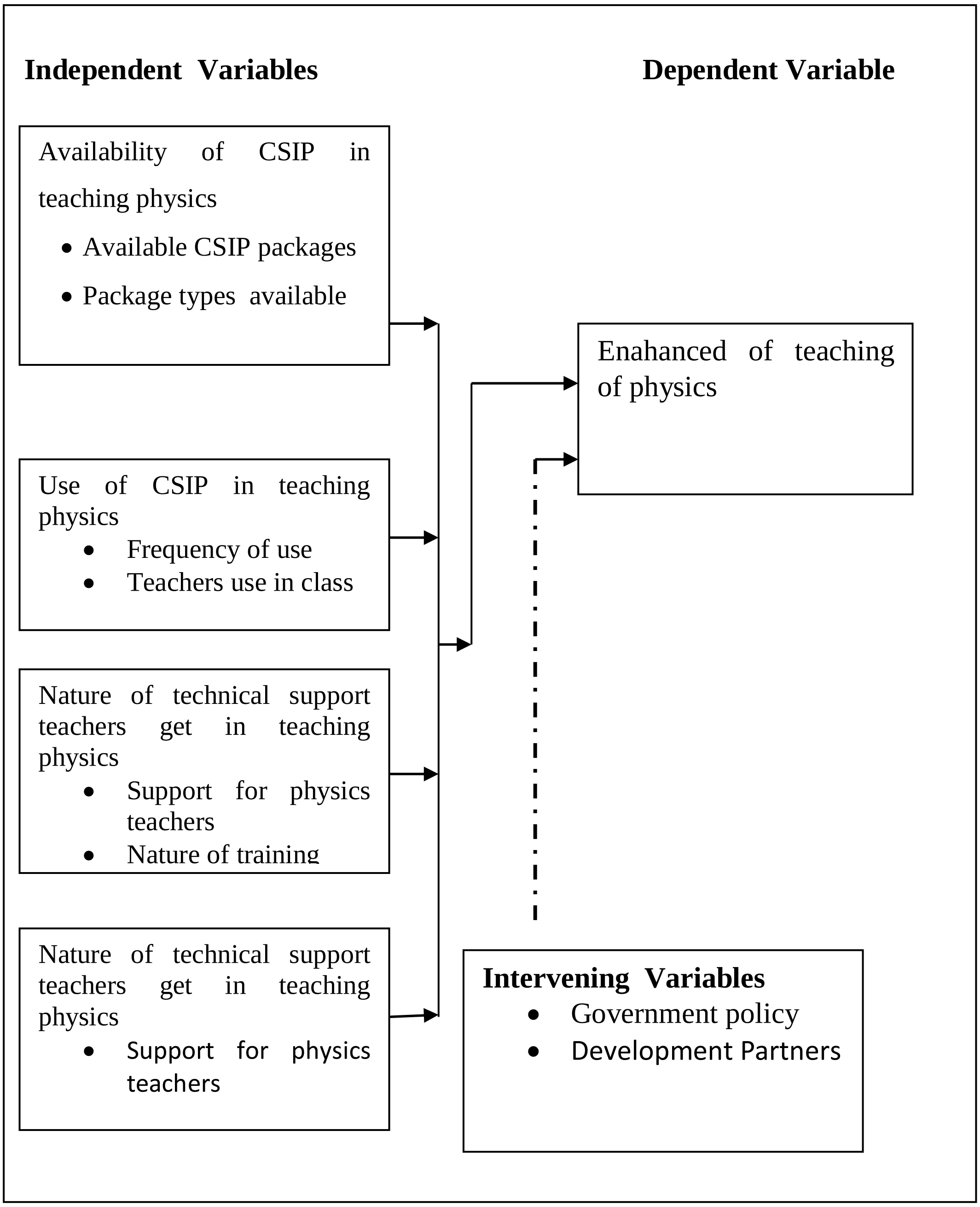

Figure 1: Conceptual Framework.

Source: Researcher

1.12 Operational Definitions of Terms

Attitude: In this study it refers to a perception or actions of physics teachers when he or she reacts in a certain way to or against a circumstance, individual, or item.

Availability: In this study it refers to the presence of CSIP teaching resources and that are in use for the purposes of teaching and learning of physics in secondary schools.

Challenges: In this study it refers to the circumstances that hinders the effective use of CSIP in the enhancing the teaching of physics in secondary schools.

Computer simulation instructional packages: It refers to dynamic models created by computers to provide simplified or theoretical representations of real-world components, occurrences and processes with the aim of aiding understanding of physics concepts.

Physics: In this study it refers to one of the science subjects taught in Kenyan secondary school curriculum that concerns with the study of matter in relation to energy.

Teaching physics: It refers to creating an atmosphere in which learners can explore and comprehend how the external system views, as well as link up complex concepts of science to their everyday life.

Technical Support: In this study it refers to the support given to physics teachers by laboratory assistants when computer simulation and instructional lesson is conducted.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The literature on teaching around the world and locally using computer simulation instructional packages in enhancing the teaching of physics is discussed in this chapter. The review is organized around the concept of CSIP, concept of teaching and the current study's objectives. The availability of CSIP for use in teaching physics, the use of CSIP in secondary schools, the teachers' attitudes toward the use of CSIP in secondary schools, the nature of technical support physics teachers get in the use of CSIP in secondary schools, and the challenges teachers face in using CSIP in secondary school physics teaching are all covered in this chapter.

2.2 The Concept of Computer Simulation Instructional package

Simulations have existed practically since the development of computers, and experts have been studying their usage in the classroom for more than 20 years (Crookall, 2010). Computer simulations enable students to observe, analyze, reproduce, and obtain responses about actual things, occurrences and procedures that were thought be too complicated, cumbersome or risky (Bell & Smetana 2008). Computer simulations, according to Smetana and Bell (2012), are computer-produced dynamic models that depict simplified or basic models of significant qualities, occurrences, or procedures. Interactive laboratory experiences, animations and visualization are examples. Time can be accelerated or decelerated in a simulated environment, and abstract concepts and implicit practices can be made transparent. Teachers may focus students' attention on learning objectives when authentic surroundings are streamlined, chronology of events is made clear, and extraneous cognitive activities are removed through simulation. (Hodson, 2014).

CSIP should be utilized in combination with hands-on workshops and programs that address the simulation's principles. Indeed, simulations employed in solitude have been shown to be ineffective (Bell & Smetana 2008). When utilized before a hands-on exercise, a simulation can help students become more comfortable with a concept in a supervised context. Simulations, which are introduced before the bulk of the official teaching, allow students to reflect on their current comprehension of the scientific subject. Quintana et al, (2018), correctly notes that Simulations based on empirical theory assist in providing a series of interconnected interactions that test learners' informal interpretation of scientific knowledge. As students evaluate numerous possible answers, this can inspire actual thought about a situation. Before any formal teaching therefore, teachers can utilize simulation to gain timely feedback on students' prior knowledge, which can then be used to drive their formal learning techniques. Pre-instructional simulations, according to Smetana and Bell (2012), may serve as a basis for further knowledge, facilitate the growth of learners' views, disclose alternative conceptions in students' thought patterns, and foster the formulation of content-related questions. These pre-instructional CSIP allow students to actively develop their personal conceptual frameworks, which is consistent with a constructivist learning model (Gunstone, 2015).

2.3 The Concept of Teaching

The phrase "teaching" refers to a set of events that happen beyond the learners' control and are meant to aid the inner learning experience. Learning is intrinsic to learners, but teaching (instruction) is external to them (Sequeira, 2010). The constructivist method to learning emphasizes that students are not passive recipients of information on which to write; rather, they attend the classroom having a variety of preconceptions, many of which are not evidence based (Llewellyn, 2013). The task of the educator is very different from just conveying knowledge, because knowledge is no longer something that can be conveyed but instead something that the student must develop over time in contact with the physical and social environment. As a supervisor of learning in the classroom, the teacher creates educational activities and surroundings in which learners can gradually develop a knowledge that is compatible with scientifically valid conceptions. It is important to examine students' early phases and have they been aware of their first perceptions about the subject being studied in order to accomplish this (Falloon, 2019). As enablers of learning in the classroom, science teachers provide relevant educational activities and situations in which learners can progressively develop an understanding that is consistent with academically acceptable interpretations. As a result, science training should assist them in: "adding durable, powerful and generative instances to their portfolio of ideas; and enabling students to engage with their entire portfolio of ideas in order to create a more cohesive viewpoint on the science field." "Technology-enhanced resources that make scientific process evident can play a vital role in learning and teaching" (Falloon, 2019).

When it concerns CSIP, the accessibility range is as broad as the topics covered. Though other simulations are incredibly self-explanatory and user-friendly, some take a long time to get used to (Bell & Smetana, 2008). If students want to use them independently, they must first learn how to use the software. Otherwise, students may become distracted by logistical concerns rather than focusing on the learning objectives. To circumvent this problem, teachers might guide the class through the simulation as a tutorial, assuring the type of student participation outlined above. Even though the application is intended for independent student usage, teachers should make sure that their students are aware with its capabilities, describe its limits, model how to use it, and provide entry to any other domain knowledge and resources that can help them with their work. Today, interactive computer simulations are one of the most common types of technology-enhanced resources used in scientific classes, and they may be utilized to teach practically every science idea in secondary school (Smetana & Bell, 2012). They also display dynamic simplified or theoretical models of real-world components, occurrences, or procedures, allowing students to view, analyze, replicate, and receive immediate feedback regarding real-world objects, occurrences, or processes. Today's scientific instructors and learners have numerous options to use computer simulations in the classroom. Students can explore countless free internet sites that feature amazing science simulations since they have access to the internet from school, home and practically anywhere else (De Jong et al., 2013).

Smetana and Bell (2012) proposed some features of effective computer-assisted settings. "If science lab tasks are designed to concentrate on technical factors, variables, and outlooks, CSIP can enhance them." By removing irrelevant information, providing direct data plotting based on the user's selected variables, and allowing the student to interrupt the activity being expressed and inform choices about simulation analysis and the nature of the information being obtained, a CSIP can bring the student nearer to a process. The student must predict outcomes and tackle his or her own concepts in order to control a simulation. According to Kekana (2016), effectively incorporating technology into science learning heavily relies on the advancement of well-designed, cohesive professional learning interventions that aim with a clear understanding of how educators need to use innovation in their subject in the most effective manner, thereby facilitating the teaching classroom learning environment.

2.4 Availability of CSIP for Use in Teaching Physics

Physics is a discipline of experimental observations, criticism, and sensible discussion, in which knowledge and understanding of its principles are dependent on how physical phenomena are perceived (Abou and Ayoubi, 2017). According to Bryan, Glynn, and Kittleson (2011), myphysics lab packages were important for secondary school students since the programs are designed to provide elation with information, fun, and a sense of interesting educational software. The PhET project developed valuable models for teaching and studying physics, which is available for free, download from the PhET website. (Moore et al., 2014). Students learn through explorations in the PhET simulations sims, which are animated, collaborative, and game-like settings (Perkins et al., 2012, June).The emphasis in these simulations is on the linkages between real-life occurrences and the underlying physics, with the goal of making experienced researchers' visual and conceptual frameworks accessible to learners (McKagan et al., 2008). The PhET simulations have two key goals: enhanced student participation and effective learning. Sims are created with the goal of assisting students in developing a strong conceptual knowledge of physics through inquiry (Perkins et al., 2012). Each PhET sims is designed to be a stand-alone educational tool, allowing teachers to select which sims to utilize. When students' research is partly supervised, whether by the instructor in a lecture or through assignment, laboratory, or recitation tasks adopting a guided-inquiry method to learning, the sims are most beneficial. Students can use the PhET simulations to build their own conceptual knowledge of physics through research (Perkins, Loeblein and Dessau, 2010).

Conventional teaching techniques have been demonstrated to be ineffective by various scholars in Physics education, including (Smetana & Bell, 2012). He poited out that the lack of or inadequacy of scientific equipment in institutions has impaired science learning. In this regard, a new unconventional alternative lab setting is necessary, under which students can do the various required tasks at any moment and in safe conditions.

In any school, the use of ICT in teaching resources is a major element of the efficacy of science education. PhET sims was used as the available packages in this study by teachers to teach physics. The aspects of preparation of suitable learning programs, as well as their performance in the classroom, are all covered by the use of CSIP (Vaughan, 2014). A teacher who wants to include ICT into science lessons should begin by considering the requirements of the lesson plan rather than technology. CSIP sims are software programs that allow the user to engage with a scientific model of the physical or natural environment. Teachers can use these programs to demonstrate concepts, while students can use them to interact with different systems and manipulate variables.

Students can visually examine the physical process taking place on the computer display in the "actual world" (Janitor, Jakab and Kniewald, 2010, March). The ability to alter the properties of the involved bodies, the environment's properties, and the nature and quantity of interactions between the bodies allows researchers to investigate the process under various settings. CSIP has a number of advantages, including the capacity to model and simulate circumstances that are impossible to achieve in an actual lab, such as an atmosphere with no air resistance, resistance, or gravity.

They can transmit dynamic features more precisely than a diagram and help learners visualize numerous processes due to its ability to animate and simulate. They allow students to perceive things that might otherwise be too quick, too slow, or obscured. While understanding the process, students are given the option of simultaneously watching a graph being plotted. The quantities' values may generally be read and used in additional calculations. The CSIP method represents a crucial learning approach because of the factors described: it can aid in the development of students' inductive and deductive reasoning, as well as their problem-solving skills, formulate and test theories, and investigate relationships between natural phenomena and processes.

Computers have been used to teach, manage, display, and communicate information, which distinguishes them from other learning instruments (Albirini, 2006). Computer simulation (CS) is a teaching method that involves the use of a computer to increase student interest and education. In other words, CSIP establishes an educational atmosphere in which a computer program or its application is employed to aid in the teaching of a physical science subject. This is due to the fact that CSIP allows students and teachers to learn at their own pace and mix active learning with CSIP (Rutten et.al., 2012). Computer simulations in physics teaching and learning: a case study on students' knowledge of trajectory motion was investigated by (Plummer and Krajcik, 2010). The influence of CS in the development of flexible comprehension of acceleration and velocity in ballistic motions was studied in this research with two groups of 15–16-year-old students (control and experimental). On these issues, both groups got typical classroom training; however, the experimental group additionally employed computer simulations. Students who worked using simulations scored much higher on the research tasks, according to the findings. The results strongly suggest that CS could be utilized as an alternate instructional tool to assist students overcome cognitive restrictions and achieve practical physics comprehension.

The Kenyan government decided to empower secondary schools with computer systems as well as some ICT resources for instructional practices of physics in particular and other science courses in general after acknowledging the tremendous potential of internet and technology in enhancing better physics curriculum delivery and the immediate need to instill computer skills in learners. According to Plummer and Krajcik (2010) CSIP has demonstrated its ability to give concrete and authentic experiences while also making data processing quicker, more efficient and faster. This is due to the fact that it integrates external experiences into the classroom, allowing students to go beyond their instructors' ability. Because of the diversity and convenience with which ICT may be used as an instructional tool or material, it has become a vital instrument for more effective and efficient physics training. As a result, various governments around the world have invested heavily in computers, internet connectivity, growth, and intellectual assistance (Gulati, 2008).

Computer simulations are being used to educate learners numerous topics in science disciplines, according to Smetana & Bell (2012), since the physical and mental dexterity requires the use of simulation that interests students in learning. CSIP is frequently utilized to pique learners' understanding of a subject in order to encourage active learning of solving problems and the learning approach, according to (ibid). As a result, CSIP has been used to teach students about cardio-vascular flow, heat, fire, velocity, and voltage in science classes. All of this necessitates early planning and preparation on the part of the teacher.

The instructor's innovation in bringing to bear on the materials those aspects of their students' interaction that make the system essential and noteworthy to them is critical to effective use of CSIP Smetana & Bell (2012). It is recommended that whenever the teacher prepares to use CSIP, the learners know the lecture content first. They propose that the teacher provide the essential crucial information to the students using appropriate contemporary teaching approaches such as lecturing. The CSIP is used to either enhance or strengthen what the teacher has already taught. A good CSIP, according to the researcher, might be the primary source of knowledge and comprehension for participants.

2.5 Use of CSIP in Teaching of Physics

Despite the availability of computers in the classrooms, many scientific teachers are reluctant to incorporate technology into their teaching methods. Odera (2011) noticed that few teachers employed computer-based innovations for teaching and that computers are not incorporated into most educational practices. According to Ertmer & Ottenbreit-Leftwich (2010), Technological improvements have now made it viable to incorporate computers into scientific education. They emphasized that the focus of education should now be on giving students opportunities to solve problems. He believes that this should include collaborative learning techniques that do not necessitate additional specific training on the users' side. He went on to say that because there is such a large selection of software accessible, computers are becoming a more natural tool to utilize in teaching. Students will gain experience working collaboratively to solve complex challenges as a result of this.

When the computer is effectively implemented, Olakanmi (2017) argues that learners will be able to use a variety of software applications to investigate a problem in a certain field. As a result, most instructors' traditional technique of educator will shift. Learners will be able to learn by doing, as this is the foundation of all science education. Students will also learn to investigate scientific issues and design opportunities to develop skills for themselves (Olakanmi, 2017).

Computer simulations have been shown to be among the most efficient ways to apply CSIP in secondary education physics classes. It promotes students to engage in physics research procedures such as questioning, predicting, hypothesizing, observing, and interpreting outcomes. Their successful implementation necessitates the availability of relevant instructional resources that are aligned with secondary education curriculum. In the last three years, computer simulations have gotten more powerful and accessible to teachers (Trundle & Bell, 2010). Instructors can now choose from a variety of computer packages available, such as those found on the internet. The computer simulations instructional packages packages are intended to aid education by allowing students to see and interact with model structure of natural processes (Smetana & Bell, 2012). Computer simulations provide simplified, dynamic, and graphical depictions of physical events and tests that would be risky, expensive, or impossible to conduct in a laboratory environment (Feyzioglu et al., 2007). Since computer simulations depict simpler representations of the physical world, they can direct learners' focus to the intended phenomenon more effectively (Sarabando, Cravino & Soares, 2014). The most successful way to teach physics is to supplement existing theories with practical applications in the laboratory (Ojediran et al., 2014). Consequently, because this method relies on resources, it cannot be used without baseline teaching materials like laboratory apparatus (NTI, 2007).

Furthermore, it may enable learners to view things and procedures which are ordinarily out of their control in the physical world (De Jong, Linn & Zacharia, 2013). Efficient computer simulations, according to Psycharis (2011), are developed on "mathematical models" to correctly illustrate concepts or procedures to be researched, and a well-made computer can connect the student in interplay by assisting the student in predicting the findings of certain activities, understanding why identified scenarios occur, exploring impacts of changing tentative verdicts and stimulating line of thought.

When CSIP methodology is used as a supplement to conventional teaching, it has the potential to result in higher accomplishment than when conventional teachings are used alone. Aside from that, learners can understand instructional content better with CSIP than they can with traditional approaches, and the level of retention using Computer Simulation may be higher. CSIP can help students become more motivated (Yuana & Maryono, 2016, January). According to research, kids who use computers have higher self-confidence, self-esteem, and are more effective and driven to learn than students who use traditional techniques (Bahous, Bacha & Nabhani, 2011). Many studies have shown that using CSIP in the classroom to enhance traditional teaching approaches is beneficial. One of the advantages of CSIP over conventional teaching methods, according to Gaytan & McEwen (2007), is that the individual receives rapid feedback. Unlike conventional teaching methods, CSIP is effective with students of all levels, including those with special needs.

2.6 Attitude of Physics Teachers towards the Use of CSIP in Teaching of Physics

As enhancers of learning in the classroom, science teachers provide relevant educational activities and situations in which learners can progressively build a knowledge that is consistent with scientifically acceptable understandings. As a result, science training should assist pupils in: "(a) adding strong, lasting, and productive instances to their repertoire of concepts; and (b) enabling students to engage with their whole repertory of concepts in order to create a more cohesive viewpoint on the science field." In both processes, technology-enhanced resources that make scientific reasoning accessible can play a significant role" (Kali & Linn, 2012). Today, CSIP is one of the most widely utilized innovation tools in science curriculum, and it is used to teach practically any research topic in the K-12 curriculum (Knowlton et al., 2015). They display dynamic conceptual or simplified versions of significant qualities, occurrences, or procedures, enabling students to view, study, reproduce, and obtain feedback regarding real elements, occurrences, and processes.

The impact of instructional resources based on Computer Assisted Teaching (CAT) versus traditional education on high school students' understanding of photosynthesis and views toward biology was explored Kurt (2013). According to the results, CAT boosted students' performance and perceptions toward biology. However, a comparison study of learners' attitudes toward physics learning using CAT and the 7E framework of Constructivist Learning techniques found that different teaching methodologies had no effect on students' opinions (Selccedil, 2010). Indeed, preliminary findings revealed that, even after taking a technological skills course, teachers' opinions regarding the use of technology in the classroom remained mostly unchanged (Ertmer et al., 2012). In reality, training programmes for educators have discovered that immersing prospective teachers in curriculum materials such as investigation or computer-based courses results in a positive adjustment in the educators' views about the resources. Teachers reported a more better outlook toward physics, exploration activities, and technology modules after taking the course (Ihindo et al., 2017). Tekerek et al., (2011) conducted a descriptive research of physics instructors' views on internet use. The study's sample consisted of 90 physics teachers who participated in the Physics Module Teaching Programs Course numbered 283 as established by the Ministry of National Education's In-Service Training Department. Teachers were chosen at random. The "Internet Use Evaluation Model" produced by Joyce & Kirakowski (2015) was used to determine instructors' views regarding internet use, while the "Personal Details Survey" was used to obtain personal information. The views of the participating instructors about internet use were evaluated and interpreted using the parameters of gender and weekly web use. The vast majority of instructors has personal computers, access the internet at home, and have a good attitude about internet use, according to the findings. Furthermore, it was discovered that female instructors have a more favourable attitude about the use of the internet in social communication and interaction than male teachers.

The usage of conventional laboratories, which needs advanced equipment and hence cannot be taken to class, can be supplied to students using virtual lab software in physics classes. Electric circuits can be created and tested using numerous java and flash technologies in an internet and computer setting, for example, so that students can accomplish basic education tasks (Karakasidis, 2013). Specifically, despite the fact that practically every school in our country has a computer lab, just one out of every four schools has a physics lab (Glewwe et al., 2013). This fact emphasizes the importance of using a digital laboratory. Brinson (2015) contrasted the performance of students' usage of virtual laboratory with application of physical laboratory in a study with pre-service physics teachers. He discovered that the experimental class, which employed application of virtual laboratory, had very good performance. The more extensive a teacher's understanding of technology is, the more likely they are to use it in their classes (Lambert, Gong & Cuper, 2008). In this regard, it is critical to determine the teachers' attitudes regarding utilizing the internet, which is a modern and technology product.

The impacts of the 5E Learning system using participatory simulation on attitude and achievement in physics education were investigated by (Sari et al., 2017). The results showed that using virtual screening as part of a 5E teaching paradigm resulted in significantly better acquisition of science theories relevant to the topic taught and relatively greater favorable attitudes toward physics than conventional teaching. The findings were also corroborated by the thoughts gathered from the experimental group's learners at the conclusion of the investigation. As a consequence, the 5E teaching paradigm combined with models had the ability to help eleventh graders enhance their academic attitude and performance in physics.

According to Jeschofnig (2011), laboratories are crucial and workplace applications are required for good scientific instruction. However, various obstacles limit or prevent the efficient use of laboratory applications. These include curriculum design that ignores science lab applications and short teaching times, negative attitudes of some educators toward laboratory applications (Yukselturk & Altiok, 2017), a lack of adequate and sufficient educational materials, an inadequate attention to safe practice, and congested classrooms (Cheung, 2008). All of these factors combine to make the utilization and efficacy of the laboratory during teaching difficult. Alternative teaching strategies have been created to address these issues and improve student achievement in science. For example, one of the promising advancements in computer technology with educational value is the usage of CSIP, which has gained attention in the curriculum (Gülçiçek, 2009).

2.7 Nature of Technical Support Physics Teachers get in the Use of CSIP in Teaching

Teachers will be able to overcome the challenges to employing computer simulations with good technical assistance in the classroom and throughout the school (Kopcha, 2012). Technical issues were determined to be a substantial impediment for teachers (Donnelly, 2010). Waiting for a webpage to respond due to poor Internet, unable to connect to a Network, faulty computers and printers, and slow and old machines are all examples of technological issues. These impediments hampered the smooth delivery of teachings and the overall flow of class sessions. According to Goktas et al., (2009), using CSIP in science instruction requires the assistance of a technologist, and if one is not accessible, a lack of technological support can be a barrier.

Computer simulations are ineffective on their own. Instruction should be tailored to stimulate scientific enquiry in attempt to implement it a potent learning instrument. In this way, computer simulations' valuable instructional potential will aid students in understanding scientific topics and encouraging conceptual change. Furthermore, computer simulations can create preconceptions among students, which can lead to effective learning as a result, computers and contemporary instruments should be included in the laboratory equipment to assist teachers in efficiently delivering curriculum. Although effective physics learning can be achieved with the most basic equipment, computers and test equipment that incorporate current technology can be helpful for teaching physics ideas and improving measurement, analytical, and processing abilities. According to Liu and Lin (2010), CSIP is a good venue for learners to study experientially and allows them to practice conflict resolution and psychomotor abilities in a secure, controlled setting. It is more effective in advancing science topic understanding, establishing process skills, and encouraging conceptual change than conventional instructional techniques such as textbook based and lecture-based and instruction in many respects.

Computer simulations allow learners to interact their learning to real-life situations (Smetana & Bell, 2012). Computer simulations help students learn more deeply by allowing them to view processes that would otherwise be invisible (ibid). Hypotheses can be tested using computer simulations by predicting outcomes (Dalgarno, Kennedy & Bennett, 2014). All of these factors contribute to better learning outcomes (Rutten, Van Joolingen & Van Der Veen, 2012). In science classes, however, teaching without learning is possible. Even with what one considers to be his or her most captivating activity or effective instructional moments, teaching can result in little or no improvement in conceptual knowledge. Even the sharpest students can learn science in order to pass a test, but then soon return to their prejudices. According to (Hetland et al., 2015), learning can and often does occur without the gain of teaching— and even in spite of it—but there is really no such thing as effective education in the absence of learning. Technical support to teachers on areas where they are unable to deliver effective content will tremendously give them a modest time to do so. Teachers must continue to create ways, develop strategies, and utilize their own intellectual capacity to ensure that the learning process is at its optimum and that the objectives of obtaining quality education are kept within the range of possibility.

Computer Simulations to Enhance Science Learning and Teaching process: A Comprehensive Analysis of relevant Literature was researched by (Bell and Smetana, 2012). Overall, the findings imply that simulations can be just as effective as conventional (i.e., college course, physics book, and/or physical hands-on) teaching techniques in terms of boosting science subject understanding, building process skills, and supporting cognitive transformation. CSIP's effectiveness, like that of any other instructional tool, is determined by how it is used and supported. When computer simulations are used as supplements, they are most effective when they (a) provide high-quality support systems, (b) foster student reflection, and (c) generate cognitive dissonance. When used correctly, computer simulations engage students in inquiry-based, real-world science investigations. Furthermore, as educational technology advance, benefits such as mobility, security, and efficiency must be considered.

According to Tobin (2010), effective use of practical sessions necessitates sufficient and convenient equipment storage, a workstation with instruments for repairing, maintaining, or constructing equipment, and enough time management skills in their timeline to maintain, arrange, and try out lab equipment prior to classes. For teachers and students to operate safely in the lab, they need suitable, up-to-date protective gear, an emphasis on standard precautions in all activities, and access to safety materials and sources, such as the AAPT publication Teaching Physics Safely (Sitzman, 2015).

Teachers require time, funding, assistance, and motivation to participate in relevant professional events in order to retain their abilities and stay current with new innovations in physics education. Attending seminars and professional conferences; analyzing new laboratory instruments, curriculum, textbooks, and resource materials; and collaborating and conferring with coworkers in schools, institutions, and the engineering and scientific research community are examples of these activities. Because students must create their own knowledge of physics topics, the laboratory plays an important role in high school physics classes. This information must be acquired by pupils in encounters with environment and the teacher, rather than merely conveyed by the teacher. Laboratory activities that are well-integrated into a learning segment will result in knowledge acquisition. In basic physics, the isolation of laboratory work from lecture is arbitrary and undesirable (Tobin, 2010).

The success of CSIP in the classroom is largely dependent on the school administration's support for teachers and pupils. It has a tremendous impact on the acceptance of technology as part of the school culture, which in turn has an impact on how people perceive technology. According to Burch (2010), an institution's culture can operate as a barrier to change. Culture of an organization, according to Zheng, Yang and McLean (2010), is a critical factor in achieving change in an organization. According to Shipp and Cole (2015), ICT management should include constantly reviewing and enacting the most appropriate techniques of exploitation, acquisition, and use of ICT. Educational management should also make sure that employee’s capacity is expanded, and that ICT usage in the institution is monitored and ensured to be functional.

However, it is recognized that there are numerous instances of CSIP use in education that did not produce the desired results (Gros, 2007). As a result, this supports the viewpoint that individuals should be skeptical about the use of Computer technology in Education. Many people today feel compelled to place a premium on evaluating computer-assisted learning approaches and practices. Computer simulations are the first of these technological tools, and they should be tested before deciding whether or not to use them in this procedure.

2.8 Challenges Teachers Face in Using CSIP in the Teaching of Physics

Rapid scientific and technical advancements, as well as changes in society's structure, have an impact on educational institutions and instructional methods in general. As a result of this development, new attempts and demands in terms of instructional procedures emerge. The use of computers in educational initiatives is one of these new attempts, as computers are regarded effective communication and individual learning aids. Computers can be used to improve learning processes on their own or in conjunction with other instructional resources (Yaghoobi & Razmjoo, 2016). It can handle drills, webinars, and simulations as part of an instructional program. As teaching tools in the classroom, computer assisted learning has a lot of potential (Parmaxi & Zaphiris, 2017). The problem is figuring out how to make the most of it. Clapper (2010) found that CSIP in learning can increase active learning in a variety of subjects, ranging from humanities to social sciences and far beyond.

The increased use of information and communication technologies (ICT) in schools poses significant problems to physics education. Physics was one of the first fields to explore the potential that computers could provide for the use of innovative teaching methods, and it continues to do so. Spreadsheets, computer-based laboratory oratories, multimedia, simulations, and intelligent tutors are just a few of the computer programs that have been developed and used in teaching Physics (Lack, 2013). Furthermore, science has frequently been used to guide instructional software design and production, as well as evaluation. The challenge for the educational system is to use learning sciences and advanced technology to produce interesting, relevant, and individualized learning situations for all students that are consistent with their interests.

Another problem facing the educational system is transforming the learning and instruction methods to equip learners with what they need to succeed in an ever-changing world. Even when the instructor's first apprehension about using computers is alleviated, there are still considerable hurdles to overcome in aim of giving adequate engineering services just so educators are not frustrated by equipment failure or program performance that they do not understand (Zetlin, MacLeod & Kimm, 2012). Fink (2013) stated that if teachers wish to provide their pupils with more successful learning experiences, they must first have a broad understanding of what constitutes a productive learning opportunity, which is enhanced by including computer simulations instructional packages. According to Alice and NO (2012), CSIP for the educational process was neither insufficient nor unavailable. Some resources are available; however, they are insufficient for teachers to use. Even though many instructors complain a lack of teaching materials, they are often liable of failing to use what is accessible, according to (Sanger et al., 2019). The current study aims to discover why these teachers do not acquire and utilize the resources provided in their educational environments.

Teachers in Kenya's 8-4-4 system, on the other hand, have a comprehensive workload within a limited amount of time. Teachers frequently contemplate their impossibility to cover the coursework in a timely basis and fully prepare learners for their national examinations; however, using CSIP can help reduce the amount of time they spend on guidance by incorporating and presenting a lot of content in summary form (Chege, 2014). The usage of CSIP in the classroom is a critical function for anyone who teaches (Plass et al., 2012). Despite the options for overcoming obstacles, the National Research Council (2011) found that "current educational systems face substantial barriers to scale implementation." He observed that enhancing a program is challenging, even if it has been proven to work, affordable, and logistically feasible in a few classrooms, because many factors influence adoption (or rejection) of any education program. The learning aim (or goals) of the computer simulation is one crucial factor that influences acceptance. A computer simulation that focuses on developing subject knowledge is a commonly accepted primary objective in current science education—might be less complicated for a teacher to use than a simulation that engages students in meaningful scientific investigation in a sophisticated virtual world, but it may also be less revolutionary (Jimoyiannis, 2010). State science requirements and examinations, on the other hand, encourage instructors to place a premium on topic mastery, inadequate time for exploration. In the face of these obstacles, science teachers who utilize simulations to involve learners in inquiry will need a lot of help to change their teaching techniques.

The most efficient way to teach physics is to supplement theoretical explanations with practical applications in the lab (Ojediran et al., 2014). Unfortunately, this approach is resource-based and hence cannot be applied without fundamental educational tools such as lab equipment and computer simulation. Many reasons contribute to poor academic performance in physics, but one of the most essential is the teacher's strategy. According to (Rutten et al., 2012), teaching physics without proper and practical instructional resources, particularly laboratory equipment and computer-assisted instructions, will almost surely result in poor academic accomplishment. Bello (2012) found that the availability and usage of physics laboratory equipment has an impact on students' academic attainment in senior secondary school physics, and that the use of proper teaching methods and equipment is crucial for effective physics teaching.

According to Danjuma and Adeleye (2015), a limited exposure to science lab research in secondary school is a major contributor to first-year university students' incapacity to understand and utilize scientific knowledge. A professionally certified Science Teacher, regardless of how well trained, will be unable to apply his or her concepts into effect if the institution lacks the scientific instruments and lab apparatus required to transfer his or her expertise into practice in the classroom. To acquire and retain good physics students, the school curriculum must be made more student-friendly, which can only be accomplished by making an investment in applicable teaching materials, particularly laboratory equipment and computer instructional materials, and empowering teachers to use them for improved teaching methodologies (Chambliss, 2014). The resource-intensive nature of science, combined with the economic downturn, renders typical laboratory hardware and other computer-assisted materials unaffordable for most schools (Danjuma & Adeleye, 2015). This leaves the dedicated teacher with little choice but to improvise, which, according to studies, necessitates the teacher's professional devotion, resourcefulness, initiative, adventure, originality, curiosity, and tenacity. Hargreaves and Fullan (2015) pointed out that whether the improvised device cost less or more than the regular produced ones, they still require money, which is frequently not easily available to the teacher.

When instructional tools are available, however, the instructor becomes a mediator of the process of leaning. Instructor must be able to use the system as part of educational technologies to give advanced technical encounters to students who otherwise have limited internet in their residences. In today's world, instructional technology plays a critical part in education. Having decent internet access, stabilizing internet access for the most of instructors, and offering technical assistance for computer use and repair are few of the issues that must be addressed in order to accomplish this vision (Education for All., 2007)

2.9 Research Gap

A survey of school teachers' use of (ICT) for governance and planning in the United Kingdom was conducted by Gil-Flores, Rodrguez-Santero, and Torres-Gordillo (2017). Muchiri (2014) conducted a study in Githunguri Sub County, Kiambu County, Kenya on factors influencing head teachers' integration of ICT in administration of public secondary schools. Lack of support for ICT integration among school heads, insufficient ICT literacy among school heads, deputy school heads, and departmental heads, inadequate ICT resources and related infrastructure, lack of professional support for departmental heads, and common power outages were all found to have a significant impact on curriculum implementation of ICT in public secondary schools.

Despite the fact that instructors are generally positive about ICT and its capacity to help them with governance and planning tasks, the results revealed that ICT is used for administration and management at a low rate. The absence of quality training, as well as the limited time and ICT resources, is all contributing factors to this lack of ICT use. All of these investigations are broad in scope. Furthermore, the majority of the studies have been carried out in industrialized countries, with less being done in Kenya, particularly in Uasin Gishu County. Furthermore, because all three science courses, biology, chemistry and physics, are covered in a research project, the majority of studies on ICT integration in teaching are conducted in a number of countries that are universal. As a result of the studies conducted, little has been done on the application of CSIP in secondary school physics education, particularly in Uasin Gishu County, necessitating this study to fill the research gap. This study will contribute to closing the gaps mentioned above by focusing on the usage of CSIP in secondary schools, specifically in Uasin Gishu County.

2.10 Summary of the Literature Review

The literature review linked to the current study was offered in this chapter. The use of CSIP resource in enhancing the teaching of physics in secondary was discussed in this section. The effects of CSIP in science education, notably in physics, are caused by the interaction between the computer simulation, the structure of the content, the learner, and the instructor. Teachers must have a positive attitude and be supplied with the required skills and expertise to apply computer simulations in order for them to be successful. The potential of computer simulations like their appropriateness for exercising examination skills may be unavailable without the right teaching attitude and skills. Instead, they could be utilized as demonstration experiments or under the teacher's entire direction. The potential of computer simulations to provide learners with the freedom to conceive, examine, and assess ideas in a more meaningfully context - specific setting is limited when they are reduced to a phase handbook manner. The impact of the teacher's role in the classroom on the use of technology by instructors is substantial. However, there has been relatively little research into the methodology for using computer simulations in the classroom by science teachers. The purpose of this research study was to found out the use of CSIP to enhance the teaching of physics in secondary schools in Uasin Gishu County-Kenya.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.0 Introduction

This chapter highlighted on the methodology used to conduct the study. It dealt with research design, study area, target population, sampling procedures and sample size, data collection instruments, validity and reliability of instruments. Lastly, it contains pilot study, data collection procedure and ethical considerations.

3.1 Research Design

Laikie & Priest (2019) defines research design as a blueprint, a plan or a strategy utilized to develop responses to the research. It comprises of the framework for data collection, assessment, and evaluation (Osanloo & Grant, 2016). The study used a mixed method design to investigate the use of CSIP in enhancing the teaching of physics in secondary school. A descriptive survey is beneficial for an evaluation that includes both quantitative and qualitative methods. Descriptive survey designs proveds a technique to address the research question for academics of many fields (Aramo-Immonen, 2011). Descriptive surveys are useful because they provide evidence and depict circumstances as they are, allowing for the determination of the procedures that must be followed to address problems in society (Kumar, 2018). The ability to triangulate, that is, the ability to apply many information sources to investigate the same phenomenon, is one of the most useful features of conducting descriptive surveys (Venkatesh, Brown & Bala, 2013). Triangulation is a strategy of identifying parts of an event by examining it from multiple perspectives and employing a variety of different techniques and strategies (ibid). It is advantageous since it provides convenient time for the research. The reason for this is that it is cross-sectional and the researcher will collect data, describe the findings as they are and allows for a variety of data gathering.

3.2 Study Area

This study was conducted in Uasin Gishu County Kenya which is located in the former Rift valley province and lies between Latitudes 0^0 00” North and Longitudes 35^0 59.88” East. The County has six sub Counties namely: Kapseret, Moiben, Kesses, Ainabkoi, Turbo and Soi as shown in Appendix VI. It has a total of 210 secondary schools. The area was chosen due to the assumption that computer simulation instructional packages were available for the purpose for this research study.

3.3 Target Population

Target population is a group of individuals as a whole, instances, or entities that share certain common observable features (Hancock & Algozzine, 2017). According to Tsang (2014), it target population defined as a group to which scientists apply its findings. The target population for this study was all the 210 secondary schools in Uasin Gishu County. The study purposively selected 30 secondary schools which the only schools offering computer studies in their school curriculum. For the purpose this study, 60 physics teachers, 30 heads of physics and 30 laboratory assistants were targeted**.**

Table 3.1: Target population

Respondents	**Target Population**
Head of physics	30
Physics teachers	60
Laboratory assistants	30
Total	120

Source: Researcher

3.4 Sampling Procedure and Sample Size

3.4.1 Sampling Procedures

Sampling is the statistical procedure of identifying a sample for the intention of generating statistical and observations inferences about that cohort (Banerjee & Chaudhury, 2010). A sample is any subset of a population from which data is collected (Chakraborty et al., 2011). The target population for this study was all the 210 secondary schools in Uasin Gishu County The study purposively selected 30 secondary schools and only ones offering computer studies in their school curriculum. For the purpose this study, 60 physics teachers, 30 heads of physics and 30 laboratory assistants were targeted**.** Purposive sampling, simple random sampling was used by this study as part of a multistage sampling strategy. Purposive sampling is a non-probability sampling approach in which the researcher selects sample components depending on his or her assessment (Alvi, 2016). A guide on choosing sample approaches for research within the study area, 30 secondary schools with ICT infrastructure were chosen using purposive sampling. A simple random sample was taken from the target population, which included physics teachers, heads of physics, and laboratory assistants from the selected secondary schools.

3.4.2 Sample Size

Sample size incorporates the individual observation or samples in any statistical context, for example, a public sentiment survey or a science experiment. Sample size involves choosing a figure of the selected samples or observations such as a science study or a social attitudes survey (Sarmah, Hazarika, & Choudhury, 2013). The sample size of 10-20% is acceptable in description research (Sophia & Owuor, 2015**).** The study purposively selected the only 30 secondary schools that had computer studies in their school curriculum. Purposive sampling and simple random of 60 physics teachers, 30 head of physics and 30 laboratory assistants formed the sample size for the study.

3.5 Data Collection Instruments

Data collection is the process of gathering and measuring information on targeted variables in an established system, which then enables one to answer relevant questions and evaluate outcomes (Murgan, 2015). This study collected data with the help of the following research instruments: Questionnaires, interview, observation schedules and a checklist.

3.5.1 Questionnaire

A questionnaire is the study's primary collection instruments. According to Dalati & Gómez (2018) questionnaire is an instrument for collecting primary data. In this study, questionnaires were developed using close-ended and open-ended questions for data collection. Similarly, questionnaires were meant to gather information from physics teachers that capture the content of the study specific objectives.

3.5.2 Interview Schedule

According to Rubin & Rubin (2011), interview schedule is basically a list containing a set of structured questions that have been prepared, to serve as a guide for interviewers, researchers and investigators in collecting information or data about a specific topic or issue. Interview technique allows for comprehensive data collection by ensuring excellent results rates and promotes genuineness (Drabble et al., 2016). In this study, interview schedule was established to fetch information from heads of physics and laboratory assistants, shedding extra information to support the data from the questionnaires.

3.5.3 Observation Schedule

According to Sparkes & Smith (2013), an observation schedule is a form of collecting data in which the researcher obtains notes on incidents as they happen spontaneously. Lopez & Whitehead (2013) defines observation schedule record as a record of what the researcher observes throughout data collection period. In this study, observation schedules were conducted to teachers carrying out physics live lesson using CSIP sims for instruction.

3.5.4 Checklist

Checklists are used to ensure that a set of precise lines of inquiry, activities, or procedures are being undertaken or have been followed (Gachau et al., 2017). These research study checklists were meant to obtain further information to provide support to the data collected through questionnaires.

3.6 Validity and Reliability of Data Collection Instruments

Mohajan (2017) revealed that when formulating research instruments, validity and reliability are both fundamental characteristics to be considered. The sections that follow explain how this study ensured the reliability and validity of its instruments.

3.6.1 Validity of the study

Yilmaz (2013) defines validity as the degree upon which instruments measure what they are designed to measure. Validity measures well on the information collected in the study and accurately represent the variables of the investigation. To establish this validity, the instruments of this study were carefully designed in relation to the research objectives and questions and presented to the supervisors to assess on the usefulness of the instruments. Upon the assessment on the usefulness of each item, the supervisors offered guidance and advice. The suggestions and corrections that arose were incorporated to enhance the validity of the instruments. This was followed by a pilot study that the researcher sought to examine the clarity and the ambiguity of items contained in the research instruments.

3.6.2 Reliability of the study

Oluwatayo, (2012) describes reliability as a metric consistency over time and among similar samples. According to Bolarinwa (2015), reliability measures the extent where a research instrument produces reliable outcomes or data after multiple trials. The reliability of the study instruments was tested through a pilot study to meet the research objectives. To achieve reliability a pilot study was conducted in two secondary schools in Keiyo-Marakwet County. Physics teachers, heads of physics and laboratory assistant were selected to participate in the study. The teachers offered to be observed during a live physics lesson. The checklists were filled appropriately as per research objectives. The completed responses were divided into two groups derived from the pilot secondary schools. The Pearson product moment was used to establish the correlation between the two sets of responses. A correlation coefficient of 0.78 was realized indicating high level of reliability.

3.7 Data Collection Procedures

The researcher applied for a research permit from the Ministry of Education, Science and Technology through the school of education at Moi University. Once this was approved, introductory letters were presented to the relevant offices for ease of conducting the research study. A research permit allowed the researcher to conduct the study in secondary schools. By making a courtesy call to their schools, all principals from the sampled schools were informed. The researcher visited the schools sampled and did the study as was planned. The researcher administered questionnaires to physics teachers while heads of physics and laboratory assistants were interviewed and checklists were served as confirmation tool. The respondents were given humble time to return the completed questionnaires.

3.8 Data Analysis

This study involved both qualitative and quantitative methods. The respondents' quantitative data was cleaned and edited in line with several variables before being structured for analysis using Statistical Package for Social Science 20.0 (SPSS Version). Quantitative data was analyzed using descriptive statistics while the qualitative data was analyzed thematically.

3.9 Ethical Consideration

Ethical policies are values that the researcher should constrain themselves to in carrying out research (Farrimond, 2012). The following research ethics were adhered to:

Seeking informed consent: According to Mamotte & Wassenaar (2015), the researcher needed to obtain appropriate consent from the participants before the administration of the study instruments. The possible benefits and value of the study was explained to the participants. They were given the option of participating or not participating.

Ensuring confidentiality of Data collected: Surmiak (2018, September), describes confidentiality as the researcher's responsibility to handle confidential information shared by the respondent. The researcher promised to keep confidential matters arising during data collection. This was in the form of opinions and attitudes. The researcher agreed to keep the data collected confidential and secure against unauthorized access. As warned by Resnik

(2011), avoid revealing details that would affect the respondents. If the participants did not want their identities to be kept private, the researcher allowed them to keep their voices and make decisions on their own, but they needed to be informed about the risks of non-disclosure, such as the inclusion of information in the official report that they may not have anticipated (Bucknall, 2012).

Ensuring anonymity: The researcher, on the other hand, should consider the right to anonymity. This happens when even the researcher is unable to correlate a participant's data to that person's data (Zimmer, 2010). By ensuring that respondents did not include their identities in the surveys, the researcher was able to maintain anonymity. Participants who, perhaps inadvertently, submitted their names on the surveys were not disclosed. No teacher was required to write his or her identity on the questionnaire. The identities of the teachers who were interviewed were not disclosed also. Even the identities of the schools that provided research data were kept confidential.

Avoiding interference with views given by participants: The researcher vowed not to tamper with any of the participants or the data acquired, and to report the information as accurately as possible.

Avoiding issues related to plagiarism**:** Others' efforts should be acknowledged by researchers (Baker & Edwards, 2012). Plagiarism occurs when a researcher uses another person's written work without their consent or citation. All sources cited in the study were consistently recognized by the researcher**.**

3.10 Chapter Summary

This chapter has described the research design and methodology that was adopted for the study. It has specifically outlined the area of study, target population, sample size and sampling procedures, data collection procedures, ethical considerations, and data analysis procedures.

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION, INTERPRETATION AND DISCUSSIONS

4.1 Introduction

This chapter covers data presentation, analysis, interpretation and discussion generated by this study. The purpose of this study was to investigate the use of computer simulation instructional packages in enhancing the teaching of physics in secondary schools in Uasin Gishu County. The specific objectives were:

a) To find out the availability of CSIP for use in enhancing the teaching of physics in secondary schools.

b) To examine how physics teachers, use CSIP in enhancing the teaching of physics in secondary schools.

c) To establish the attitudes of physics teachers towards the use of CSIP in teaching physics in secondary schools.

d) To determine the nature of technical support physics teachers, get in the use of CSIP in enhancing the teaching of physics in secondary schools.

e) To identify the challenges teachers face in using CSIP in enhancing the teaching of physics in secondary schools.

In the first section, a description of the response rate and the demographic information of the the respondents who participated in this study are presented. In order to facilitate data for analyses, presenting and interpreting in this chapter, the researcher considered the use of varied methods of data generation. The research used a questionnaire for physics teachers; the interview guide was used to attain responses from the Head of physics (HoP) and laboratoray assistants, also physics teachers whos lessons were observed participated in an interview. In this study checklist was used obtain the information in relation the objectives of of this study. Data collected was evaluated using descriptive statistics as well as narratives and themes. Tables and percentages are used in presentations.

4.2 Response Rate

The goal of this section was to ascertain the participant's return rate. In this survey the study sampled and distributed the questionnaires to 60 physics teachers, interviewed 30 heads of physics and 30 laboratory assistants.

Table 4.1: Response rate

Staff Category Respondents	Frequency	%
Laboratory assistants	26	87
Head of physics (Hop)	24	80
Physics Teachers	54	90
Total	**104**	**87**

From the findings in table 4.1 the researcher received questionnaires from 54 the physics teachers. This showed a response a rate of 90%. The researcher interviewed 24 heads of physics and 26 laboratory assistants. This represents respose rate of 80% and 87% respectively. This study showed that the response rate was above 50% thus was deemed adequate for both the analysis and interpretation of the data (Nulty, 2008).

Table 4.2: Schools Observed Conducting a Physics Lesson

School Category	Respondents	
	Frequency	Percentage
National school	2	100
Extra-county	4	67
County	5	50
Sub-county	4	40
Total	**15**	**50**

The results are represented in table table 4.2. The results of the observed schools showed that 2(100%) formed national schools, 6(67%) Extra-County schools, 5(50%) County schools and 4(40%) Sub-County schools. The results showed that majority of county and sub county schools formed 9(60%) of the schools. The results of the responses revealed that 50% of schools sampled is adequate for purposes of analysis and interpretation of data (Nulty, 2008). The results showed that majority of schools in the county and sub counties were limited on the use of CSIP as compared to extra counties and national schools with 100% participation.

4.3 Respondent Demographic Information

This section the researcher sought to establish the respondent's demographics in the following categories: gender, age, professional qualifications, and teachers experience. This study sought to find out if there was a link between the categories and teaching physics using CSIP in secondary schools in Uasin Gishu County.

4.3.1 Distribution of Respondents by Gender

The respondents were required to state their gender and establish whether gender had any influence in the use of CSIP in teaching physics in secondary schools in Uasin Gishu County. The results are summarized in table 4.3.

Table 4.3: Distribution of Respondents by Gender

	Physics Teachers		**Heads of Physics**		**Laboratory Assistants**	
Gender	**F**	**%**	**F**	**%**	**F**	**%**
Male	38	70	14	60	22	85
Female	16	30	10	40	4	15
Total	**54**	**100**	**24**	**100**	**30**	**100**

The findings of the study presented in table 4.2 depicts a population of 38 (70%), 14 (60%) and 22 (85%) for males teachers, Hops and laboratory assistants respectively. Similarly; 16 (30%), 10 (40%) and 4 (15%) for female teachers, Hops and laboratory assistants respectively. Thus the study asserts that there were more males than females in the department of physics depicting gender disparity in physics section. Akala (2019) asserted that gender inequality in education is still an issue in Kenya and South Africa.

4.3.2 Distribution of Respondents by Age

The researcher sought to find out the distribution by age of physics teachers. The findings are in table 4.4

Table 4.4: Distribution of Respondents by Age

Age (Yrs.)	Physics Teachers	
	Frequency	**Percent**
< 30	11	21.3
31-40	11	19.1
41-50	18	31.9
>50	14	27.7
Total	**54**	**100**

The results presented in table 4.4 showed that 11 (21.3 %) of the physics teachers were aged below 30 years, 11 (19.1%) were between 31-40 years, 18 (31.9%) were between 41-50 years and 14 (27.7%) were more than 50 years. The age distribution of the respondents showed that majority of the physics teachers were below 50 years of age representing energetic population with knowledge to deliver adequately. This study could attribute the computer knowledge physics teachers had to the training attained from colleges and universities. This implies that teaching using CSIP in teaching physics could be successfully achieved owing to majority physics teachers are equipped with computer knowledge.

4.3.3 Distribution of Respondents Professional Qualification

The researcher in this section sought to find out the distribution of respondents by professional qualification. The findings are in table 4.5.

Table 4.5: Distribution of Respondents by professional Qualification

Academic Qualification	Physics Teachers		Hops		Laboratory Assistants	
	No	%	No	%	No	%
Certificate	0	0.0	0	0	4	15
Secondary 1 (S1)	1	2.1	2	5	0	0
Diploma	12	21.3	3	15	22	85
Bachelors	29	53.2	12	50	0	0
Masters	12	23.4	7	30	0	0
Total	**54**	**100**	**24**	**100**	**26**	**100**

The results shown in table 4.5 reveals that 1 (2.1%) and 2 (5%) of the teachers and Hops had Secondary teacher 1 (S1) respectively, 12 (21.3%), 3 (15%) of the teachers and Hops had a diploma respectively, 29 (53.2 %) and 12 (50 %) of the teachers and Hops had bachelors degree respectively, while teachers and Hops with masters degree were 12 (23.4%) and 7 (30 %) respectively. The percentages shows that majority of the respondents had a qualification of diploma and above at 53 (98.1 %) and 22 (91.6%) for both teachers and Hops respectively. The results show that professional training is appropriate to enhance teachers' skills and performance in use of CSIP in teaching physics. For laboratory assistants showed that 4 (15%) and 22 (85%) were holders of certificate and diploma certificate respectively, which implies they were qualified and had the required training to perform their duties.

4.3.4 Distribution of Respondents by Teaching Experience Using CSIP

The study in this section sought to find out teaching experiences using CSIP in teaching of physics and state whether experience has any influence in teaching of physics. The findings are presented in table 4.6.

Table 4.6: Distribution of Respondents by Experience in using CSIP

Experience (Yrs.)	Physics Teachers		Head of physics		Laboratory Assistants	
	Frequency	%	Frequency	%	Frequency	%
< 2	14	25.5	8	30	5	20
2-4	29	53.2	6	25	4	15
5-9	7	12.8	5	20	9	30
10-14	3	6.4	2	10	5	20
>14	1	2.1	3	15	3	14
Total	**54**	**100**	**24**	**100**	**26**	**100**

The results presented in table 4.6 reveals that 14 (25.5%) and 8 (30%) of the teachers and Hops had experience of less than 2yrs, 29 (53.2%) and 6 (25%) had an experience of 2-4yrs, 7 (12.8%) and 5 (20%) had an experience of 5-9yrs, 4 (6.4%) and 2 (10%) had an experience of 10-14yrs and 1 (2.1%) and 3 (15%) had an experience of over 14yrs. Majority of laboratory assistants had a work experience of more than 5yr at 17 (65.3%). These results could imply that a higher number of secondary schools in Uasin Gishu County had an experienced staff with enough knowledge required for the purpose of this study. The results showed that a higher number of the respondents had experience of more than two years. According to Langat (2018) revealed that teacher's experience would positively influence the academic achievements of the learners in secondary schools.

4.3.5 Distribution of Respondents on In-Service Attendace

This section the researcher sought to find out whether the respondents attended in-service training with respect to the use of CSIP in teaching physics in their schools.

Table 4.7: Distribution of Respondents by In-Service Attendace

Response	Respondents					
	Physics Teachers		Head of Physics		Laboratory Assistant	
	No	Percent	No	Percent	No	Percent
Yes	41	77	22	90	6	22.4
No	13	23	2	10	20	77.6
Total	**54**	**100**	**24**	**100**	**26**	**100**

The results showed in table 4.7 formed 41 (77%), 22 (90%) of physics teachers and Heads of physics (Hops) were trained through in-service while 13 (23%), 2 (10%) did not attend any in-service training. Similarly, the results from the table depict 6 (22.4%) of the laboratory assistants were trained through in-service training while 20 (77.6%) did not attend any in-service training. The majority of teaching staff were trained through in-service while majority of laboratory assistants did attend in-service training. Makewa, Role & Biego (2011) stated that Kenya's government was in response to continuous poor performance initiated an in-service training to science and mathematics teachers through a SMASSE program.

4.4 Availability of CSIP Used in Teaching Physics in Secondary School

The first objective of this study sought to find out the availability of CSIP in enhancing the teaching of physics in secondary schools. The gathered information using, questionnaires, interview, and observation schedules and checklist. The findings are represented in the subsequent sections.

4.4.1 Types of CSIPs Available in Teaching Physics in Secondary Schools

In this section the researcher sought to find out the availability of CSIP from physics teachers. The findings are presented in table 4.8.

Table 4.8: Types of CSIP packages Available in Secondary Schools

	Physics Teachers	
CSIP	**Availability**	
Packages	**Frequency**	**Percentage**
PhET sims	24	44.5
Myphysics lab sims	21	38.8
Web based sims	9	16.7
Total	**54**	**100**

From the findings shown in table 4.8 showed that PhET sims CSIP packages were available at 24 (44.5%). Myphysics lab sims CSIP packages at 21 (38.8%). The web-based sim packages were depicted at 9 (8%). The results of the findings showed that both PhET sims and Myphysics lab sims packages formed the majority available CSIP for teaching in secondary schools. This study also reveals that majority of secondary schools had inadequate teaching CSIP sims and dismal internet connectivity for teaching physics.

Physics teachers observed in an actual physics lesson showed that 13 (47%) used CSIP resource to instruct their lessons. This observation informs that the results is in agreement that majority of schools were inadequately equipped with CSIP for teaching of physics in schools. Kipsoi, Chang'ach & Sang, (2012) agrees to this finding by stating that costs on maintaining the internet slows down the use of ICT in schools programs.

The researcher conducted interviews on teachers who were earlier observed in an actual physics lesson. The teachers were asked why they did not use CSIP in their teaching and teachers gave varied responses:

A teachers reported that*:*

> *"the school do not have sufficient funds to purchase the equipment that will enable the use of CSIP for teaching"* (as depicted by respondent no. 2)
>
> *"The school lost CSIP projecting equipment through theft and we are unable to conduct lessons. "* (as depicted by the respondent no.7)
>
> *"The school lacks rooms for use to accommodate the students to use CSIP effectively"* (as depicted by respondent no 4.)

Other teachers agreed that they had the equipment to conduct CSIP in teaching of physics in their schools.

The findings of this study revealed that majority teachers observed pointed out that of secondary schools did not have enough CSIP resources to conduct teaching of physics as expected. Bariu (2020) in study on ICT in schools established that most schools have low investment in ICT infrastructure due to high costs of computer hardware, software and related accessories.

4.4.2 CSIP Packages used in Form Two Physics Syllabus

This section of the study sought to establish CSIP packages available to form two physics syllabus. This is depicted in Table 4.9.

Table 4.9: CSIP Packages used in Teach Form Two Physics Syllabus.

	Packages					
	PhET	Sim	Myphysics	Lab Sim	Web	Based Sim
Form II Physics Syllabus	**No**	**%**	**No**	**%**	**No**	**%**
Properties of matter	35	83.0	35	83.0	7	17
Magnetism	30	70.2	30	70.2	12	29.8
Magnetic effect of an electric current	31	74.5	31	74.5	11	25.5
Force and Moment II	30	72.3	30	72.3	12	27.7
Linear motion	32	76.6	32	76.6	10	23.4
Work, energy, power/machines	34	80.9	34	80.9	8	19.1
Waves I	36	85.1	36	85.1	6	14.9
Sound I	36	85.1	36	85.1	6	14.1

The findings in tables 4.9 shows that PhET used in form two physics syllabus was at average of 47 (79%), myphysics lab sim formed an average of 47 (78%) while Web based packages formed at 12 (21%). The results of the findings shows that majority of the topics are taught using both the PhET sims and the Myphy lab sims while web base sims are leased common. The reason that all teachers agreed that use PhET sims and myphysics lab sims is because KICD was tasked to develop them for use to physics curriculum (Gachinu, 2014). Bariu (2020) in study on ICT in schools established that most schools have low investment in ICT infrastructure due to high costs of computer hardware, software and related accessories. This implies that secondary school principals should strive invests on CSIP resources.

Interviews were conducted on HoPs on the availability of CSIP facilities used by physics teachers and the following were their responses;

> HoPs reported that:
>
> "*There are few CSIPs available to be used in teaching of physics in our school" (*as depicted by the respondent no.22*)*
>
> "*We do not have CSIP in our school for lack of budgetary allocation to it"* (as depicted by the respondent no.2)
>
> "*We borrow projectors to conduct physics lessons using CSIP Sims from our neighboring schools*" (as depicted by the respondent no. 17)

The findings on this study showed that majority of HoPs interviewed agreed that secondary schools had inadequate CSIP resources in teaching physics.

An observation conducted in a live physics classroom lesson sought to find out the types of CSIP available for the purposes of teaching physics and this study found out that majority of the schools had PhET sim and myphysics lab sims types stored in

DVDs. DVDs sims are available and sold to schools by KICD at an affordable fee upon school's request (Gachinu, 2014).

Check list that was used in this study to establish the availability of CSIP in secondary schools, revealed that 16 (54%) of the schools did not have CSIP for use in teaching physics. Chetambe (2013) pointed out those school administrators face challenges in terms of planning and procurement management.

4.5 Use Of CSIP In Enhancing The Teaching of Physics in Secondary Schools

The second objective sought to examine the use of CSIP in teaching physics in secondary schools. The study used the following research instruments: Questionnaire, interview, and observational schedules. The information was collected, analyzed and presented in subsequent sections below.

4.5.1 The Frequency at Which Physics Teachers Use of CSIP Sims in Teaching Physics

In this section the researcher sought to find out the frequency physics teachers use CSIP to teach in an actual lesson.

Table 4.10: Frequency of CSIP to Teach a Physics Lesson

Subject Lesson	Frequency of use	
	Frequency	Percentage
Topic	10	33
Sub-Topic	14	43
Revision	12	40
Tutorial	10	33

The results shown in table 4.10 on the frequency for use by physics teacher form 10 (33%) use to cover the topic, 14 (43%) use to teach on sub-topics, 12 (40%) use for revision and 10 (33%) used for tutorials. The results shown reveal that majority of Physics teachers are of the view that CSIP is used to teach sub-topic and revision.

This findings on physics teachers felt that 56% of secondary schools has inadequate CSIP for use in teaching physics. According to Chetambe (2013), school administrators face challenges in terms of planning and procurement management. Gachinu, (2014) revealed that lack of teaching resources slows down the use of digital instruction in teaching in secondary schools.

4.5.2 Use of CSIP sims in Teaching Physics in Secondary Schools

In this secton the study sought to examine how physics teachers used CSIP sims in enhancing the teaching of physics in secondary schools. The responses are depicted in table 4.11.

Table 4.11: Use of CSIP in Teaching Physics in Secondary Schools

Statement	SD		D		N		A		SA	
	No	%	No	%	No	%	No	%	No	%
Use of CSIP raises learner's attention class	5	8.5	7	12.8	4	6.4	13	21.3	31	51.1
Use of CSIP takes a short time cover a lesson	6	10.6	10	17.0	3	4.3	17	27.7	24	40.4
Use of CSIP gives clarity to difficult physics concepts	5	8.2	10	16.6	0	0	22	36.8	23	38.4
Topics that are difficult are taught using CSIP	20	34.0	15	25.5	3	4.3	13	21.3	9	14.9
CSIP relays on mains power supply to take place	14	23.4	19	31.9	6	9.5	15	25.5	6	10.6
Lab assistant must be present to facilitate the use CSIP	8	12.8	19	31.9	6	10.6	18	29.8	9	14.9
Internet connectivity is not required to facilitate the use of CSIP	6	10.6	7	11.6	9	14.9	27	44.7	11	19.1

Key: SD= strongly disagree; **D**= disagree; **N**= neutral; **A**= agree; **SA**= strongly agree

The findings of this section is represented in table 4.11, shows physics teachers thoughts on use of CSIP sims to conduct physics lessons with an aim of obtaining good results from the learners. This study made assessments in seven main themes and each theme is presented, interpreted and discussed in the subsequent subsections.

4.5.2.1 Use of CSIP raises learner's attention in class

The first statement in this section was sought to find out if use of CSP Sims raise learners attention. This study showed that 11 (21.3%) disagreed that use of CSIP raises learners attention, 39 (72.4%) agreed while 4 (6.4%) were undecided. This study found out that majority of physics teachers agreed that use of CSIP sims raises leaner's attention in classroom. The use of CSIP in teaching physics motivates learners and a booster to achieve better results. Smetana and Bell (2012) agrees that use of CSIP sims stimulates students learning better achievement in their academic performance.

An observation conducted to physics teachers that sought the understanding and learners activities in a live classroom lesson and this study found out those learners flows well and were active to the content displayed on screen. This study also found out that students felt motivated upon realizing the content taught earlier could be understood better through the use of CSIP sims. CSIP based learning provide concrete and realistic experience and makes information processing easier, faster and more efficient (McKagan et al., 2008).

4.5.2.2 Use of CSIP takes a short time cover a lesson

The respondents feelings on time to complete a planned lesson, showed that 15 (27.6%) disagreed that it takes short time, 36 (68.1%) agreed, 3 (4.3%) were undecided. This study found out that majority of respondents agreed that it takes a shorter time to cover a lesson using CSIP sims for instruction. Rutten, Van Joolingen & Van Der (2012) revealed that the effects of computer simulations improve on learning processes and outcomes. Physics teacher’s felt that using CSIP sim improves on efficiency in terms lesson coverage.

An observation that were made to physics teachers conducting a live classroom lesson revealed that 50% of the time was sufficient to cover the lesson. This findings is agreement as earlier stated that it takes a short time cover lesson using CSIP to conduct a lesson.

4.5.2.3 Use of CSIP sims Gives Clarity to Difficult Physics Concepts

The feelings by the respondents on the statement, use of CSP clarity offers to difficult physics concepts, 14 (24.8%) disagreed, 40 (75.2%) agreed, non was undecided. The research found that majority of physics teachers agreed that use of CSIP gives clarity to difficult physics concepts. Wekesa et al., (2008) agreed that the use of computers in science education makes it easier for difficult concepts to be understood.

An observation that sought to find out the use of CSIP sims in a live lesson classroom established by majority of physics teachers that was either used to supplement the topic content or reinforce,and combine the existing knowledge. The use of CSIP sims based instructional live classroom facilitates teaching through visualization and interaction with dynamic models of natural nature (Smetana & Bell, 2012).

4.5.2.4 Topics that are Difficult are Done Using CSIP

The respondents feeling on this statement showed 31 (59.5%) disagreed that difficult topics are done using CSIP sims, 20 (36.2%) agreed while 3 (4.3%) were undecided. This study found that majority of teachers disagreed on the notion that difficult topics are done using CSIP sims. According to Develaki (2019), understanding on how to perform science subject today requires knowledge of methodology and philosophy of CSIP.

4.5.2.5 CSIP relays on mains power supply to take place

The findings by the respondents on the statement showed that, 29 (55.3%) disagreed that mains makes the use of CSIP sims to carry out a lesson, 20 (36.1%) agreed while 5 (9.5%) were undecided. This study found that majority of the respondents disagreed that mains power is a must to actualize the use of CSIP in classroom teaching. The responses according to this study could imply that CSIP could conduct using other alternative power sources. According to Crossland, Anuta & Wade (2015) stated that alternative power to grid is available from solar photovoltaic.

4.5.2.6 Laboratory assistant is helpful when the Teachers use CSIP sims in Classroom

In this section the researcher sought to find out whether laboratory assistant is useful when physics teacher is conducting a lesson using CSIP sims. This study showed that 24 (44.7%) disagreed, 24 (44.7%) agreed while 6 (10.6%) were undecided. This study found out that, at average, the respondents felt that laboratory assistants were useful to make them discharge the teaching using CSIP Sims better. Computer laboratory assistant position was established in secondary schools to provide technical assistance to physics teachers. According to Awuor & Kaburu (2014) agrees to the research findings that physics laboratory assistants are employed to give technical help schools laboratory.

An observation made on a live classroom lesson, this study found out that majority of laboratory assistants were not present to give any technical support to the physics teachers as CSIP sims was used as mode instruction. The simple limitation to laboratory assistants could be attributed to lack skills to handle computer related operations to disseminate content to the learners.

Interviews were conducted to establish the role laboratory assistant when CSIP is used to teaching physics and following were their responses:

Teachers reported that:

> "*I set up CSIP sims and the displaying equipment before the physics lessons begins*" (as depicted by respondent no.2)
>
> "*I have not attended an in-service training to learn on the use of CSIP in teaching physics"* (as depicted by respondent no. 25)
>
> "*My school has inadequate CSIP sims to demand the services of an in-service training*" as depicted by respondent no. 9)

The findings of this study showed that majority of teachers interviewed indicated that laboratory assistants had not attended in-service training to sharpen their computer skills.

The interview on the question on whether laboratory assistants are accessible to internet facilities for purposes of teaching using CSIP and the following responses:

> "*I have no problem to access internet connectivity in my school*" (as depicted by respondent no. 11)
>
> "*The internet connections in schools is not operational*" (as depicted by respondent no. 9)
>
> "*My school have a problem with internet connectivity"* (as depicted by respondent no. 4)

The findings of the study showed majority of the schools experienced limited internet connectivity. This study also established that majority laboratory assistants have little knowledge in internet operations in their schools.

4.5.2.7 Internet connectivity is not required to facilitate on the use of CSIP

This study established that 34 (63.8%) disagreed internet connectivity is not required to facilitate use of CSIP, 12 (21.2%) agreed while 8 (14.9%) were undecided. The findings of this study was that majority of the respondents disagreed that internet is not required to use of CSIP for teaching physics. The internet connection provides teachers and students with the platform to fetch necessary learning materials and on-line learning. Bariu (2020) stated that ICT infrastructure is necessary in teaching and learning in secondary schools.

4.6 Attitudes of Physics Teachers on The Use of CSIP in Teaching Physics

The third objective of this research study sought to establish attitudes of physics teachers on the use of CSIP in teaching physics in secondary schools. The study gathered information using questionnaires and observation schedules. The information gathered were presented in subsequent sections.

4.6.1 Teacher's Attitudes on The Use of CSIP in Teaching Physics in Secondary School

In order to achieve on this objective, this section of the research study sought to establish teacher's attitudes on the use of CSIP in teaching physics. Thus; six questionnaire items were used to examine the prevailing status of teacher's attitudes as depicted in table 4.12 below.

Table 4.12: Teacher's Attitudes in Using CSIP to Teach Physics in Secondary Schools

Statement	SD		D		N		A		SA	
	No	%	No	%	No	%	No	%	No	%
I prefer teaching without support of CSIP sims	10	17	29	48.9	3	4.3	14	23.4	4	6.4
Use of CSIP will require teachers to attend in-service training	6	10.6	20	34.0	3	4.3	19	31.9	12	20.1
Use of CSIP prolongs lesson period	10	23	13	21.3	1	2.1	14	17	22	36.2
Using CSIP sims takes a long time for lesson preparation	10	17.0	18	29.8	0	0.0	17	27.7	15	25.5
CSIP is not suited for physics concept explanation	14	23.4	19	31.9	1	2.1	17	27.7	9	14.9
Overcrowded classes make CSIP use ineffective	19	31.9	26	42.6	3	4.3	11	19.1	1	2.1

Key: SD= strongly disagree; D= disagree; N= neutral; A= agree; SA= strongly agree

4.6.1.1 I Prefer Teaching Without Support of CSIP Sims

In this section the study sought to find out the teachers preference on the choice of lesson delivery. This study revealed that a total of 36 (65.9%) respondents disagreed that they prefer teaching without the support of CSIP sims, 16 (23.4%) agreed and 2 (4.3 %) were undecided. The findings showed that majority of the participants disagreed that they prefer teaching without support from CSIP sims. The reason why CSIP is popular is because majority of physics teachers were trained in computer applications in teachers colleges and universities. Dalinger et al., (2020) agreed with the findings that learning experiences with simulations increases learner's participation confidence in a classroom.

4.6.1.2 Using CSIP will Require Teachers to Attend In-Service Training

In this section this study sought to find out whether physics teachers must attend in-service training to be able to conduct lessons using CSIP sims. The study found out that 24 (44.6 %) of the respondents disagreed that physics teachers require an in-service training to conduct lessons using CSIP sims, 27 (51%) agreed and 3 (4.3%) were undecided. The findings indicate that 50% the respondents would prefer to attend an in-service course and the rest are confident to teach without.

Interviews were conducted on Hops on the knowledge they had in the use of CSIP and the following were their responses:

> **“***I have the knowledge on the use of CSIP to teach physics after attending an In-services training through government funded programs*” (as depicted by the respondent no.3)
>
> “*I was trained on computer skills while I was in the university*” (respondent no. 8)
>
> “*I attended an In-service in the use of CSIP teach physics in my school*” (as depicted by the respondent no. 16)

The study found out that in-service training offered to physics teacher were mend to refresh them due to changes in technology after undergoing training while they were in the universities and colleges. In agreement to these findings Ponge (2013) showed that universities seeking relevance today must produce graduates who are fit the job market.

4.6.1.3 Use Of CSIP Sims Prolongs Lesson Period

In this section this study sought to find out whether using CSIP sims delays syllabus coverage. This study found that 29 (53.2%) of the respondents disagreed that use of CSIP delays syllabus coverage, 24 (44.7 %) agreed while 1 (4.3 %) were undecided. The findings of this study showed that majority of the respondents disagreed that syllabus coverage delays when teachers use CSIP sims is in teaching physics. Physics teachers, according to Boadu (2014), encounter problems such as a lack of technological resources, an insufficient time, and a lack of drive while attempting to employ technology in the classroom.

4.6.1.4 Using CSIP sims Takes Long Time for Lesson Preparation

In this section this study sought to find out whether using CSIP sims prolongs lesson preparation. This study revealed that 25 (46.8%) of the respondents disagreed that using CSIP takes long of time for lesson preparation while 29 (53.2%) agreed. The study was revealed that majority of the respondents agreed that it takes a long time to prepare a lesson using CSIP sims. The major barriers that prolong lesson preparation could be lack of genuine software, inadequate computer in the classroom, low speed internet, lack of proper training skills, unavailability of latest ICT equipment, lack of expert technical staff, poor administrative support (Smetana & Bell, 2012).

4.6.1.5 CSIP is Not Suited for Physics Concept Explanation

In this section this study sought to find out whether CSIP sims is suited for concept explanation. The study found that 30 (55.3%) of the respondents disagreed that CSIP is not suited for physics concept explanation, 23 (42.6%) agreed while 1 (2.1%) were undecided. The study concluded that majority of the respondents did not agreed that CSIP is not suited for physics concept explanation. Ng'eno & Changeiywo (2013) supported the findings by stating that a computer simulation addresses learners concerns as regards to physics abstract concepts.

4.6.1.6 Overcrowded Classes Make CSIP Use Ineffective

In this section this study sought to find out whether overcrowded classes make use of CSIP ineffective. This study revealed that 45 (74.5%) of the respondents disagreed that overcrowded classes makes use of CSIP ineffective, 12 (21.2%) agreed, while 3

(4.3%) were undecided. The findings of this study shows that majority of respondents disagreed that crowded classes impacts negatively on the use of CSIP facility. The schools with established laboratories can accommodate a reasonable class numbers without difficulties.

4.7 The Nature of Technical Support Physics Teachers Get in The Use of CSIP in Teaching in Secondary Schools.

The fourth objective the researcher sought to determine the nature of technical support physics teachers get in use of CSIP in teaching secondary schools. The study gathered information on teachers' questionnaires and laboratory assistants' interviews. The information was presented in subsequent sections.

4.7.1 The Nature of Technical Support Physics Teachers Get in Use of CSIP

In order to accomplish this objective, the researcher sought to determine nature of technical support physics teachers get in use of CSIP. Thus; four questionnaire items were used to examine the prevailing status of technical support as depicted in table 4.13.

Table 4.13: Technical Support Physics Teachers Get in Use of CSIP

Statement	SD		D		N		A		SA	
	No	%	No	%	No	%	No	%	No	%
Lack of technical support limits use of CSIP	9	14.4	15	25.5	4	6.4	22	36.2	10	17
The laboratory assistant provides maintenance of computer equipment	8	12.8	27	44.7	6	10.6	17	27.7	2	3.3
Laboratory assistant is not familiar with CSIP associated accessories	6	10.6	19	31.9	8	12.8	14	23.4	13	21.3
Physics teachers use CSIP without Technical support	15	25.5	17	27.7	6	10.6	3	4.3	19	31.9

Key: SD= strongly disagree; **D**= disagree; **N**= neutral; **A**= agree; **SA**= strongly agree

4.7.1.1 Lack of technical support limits use of CSIP

This study showed that 21 (39.9%) of the respondents disagreed that lack of technical support limits uses of CSIP, 39 (53.2%) agreed while 3 (6.4%) were undecided. This study found that a majority of the respondents agreed that lack of technical support limits the use of CSIP sims in teaching physics in secondary schools. A study by Keiyoro (2010) agreed to this finding that technical support is achieved by having a face to face in ICT service-training. The lack of technical support is a challenge to physics teachers as they use CSIP sims for teaching to improve on learners' academic achievements.

Interviews made to the laboratory assistants on the question on whether they give technical support to physics teachers using CSIP sims and the following were their responses:

Laboratory assistants reported that:

> "*I have not had a chance to train through an in-service program on the use of CSIP sims in my school.*" (as depicted by the respondent no. 13)
>
> "*The schools has not been funds allocated for in-service training in my school*" (As depicted by the respondent no. 7)
>
> "*My school has inadequate CSIP sims which limits me to go for in-service training*" (as depicted by respondent no. 24)

This research holds that majority majority of laboratory assistants interviewed attested that they lacked in-service training and poses a major challenge on the technical support physics teachers get from them. The technology keeps on changing all the time on the use of computers and there is therefore need for teacher's empowerment on the use of CSIP.

4.7.1.2 Laboratory assistant has the skills to maintain computer equipment

This study showed that 32 (57.5%) of the respondents disagreed that laboratory assistant has the skills to maintain computer equipment, 17 (32%) agreed while 5 (10.6%) were not decided. This study found that a majority of the participants disagreed that laboratory assistants has the necessary skills to maintain computer equipment. Alkahtani (2017) agreed with the findings that lack of mastery of electronic equipment is a challenge to the use of computer instructional learning in schools. The skills required by laboratory assistants is obtainable through in-service training on the use of CSIP organized by schools authorities.

An interview was conducted to laboratory assistants on the question of whether they have the skills to maintein and repair CSIP and associated accessories and the following were their responses:

Laboratory assistants reported that:

> "*I do not have the knowledge on the repairs and maintenance of the CSIP and the associated accessories*" (respondent no. 16)

> "*I do not have the expertise on repairs and maintenance the CSIP associated accessories"* (as depicted by respondent no. 4)

The findings of this study holds that majority of laboratory assistants interviewed were of opinion that they lack the skill and the knowledge to repair and maintain CSIP equipment.

4.7.1.3 Laboratory assistant is not familiar with CSIP Associated Accessories

This study showed that 23 (42.1%) of the respondents disagreed that laboratory assistants is not familiar with CSIP supported infrastructure, 24 (44.7%) agreed while 7 (12.8%) were not decided. The study found that a majority of the respondents agreed those laboratory assistants are not familiar with use of CSIP supported infrastructure. The findings of this study showed that laboratory assistants are lacking technical training on the use of CSIP supported infrastructure.

4.7.1.4 Physics Teachers Use CSIP without technical support

This study showed that 29 (53.2%) of the respondents disagreed that physics teachers can teach using CSIP without technical support, 20 (36.2%) agreed while 5 (10.6%) were not decided. The findings of the study revealed that majority of the respondents found it difficult to teach using CSIP sims without technical support. The nature of technical support physics teacher need in the use of CSIP sims is of essence to achieve on the academic excellence in secondary schools.

4.8 Challenges Teachers Face on Use of CSIP in Teaching Physics in Secondary Schools.

The fifth objective the researcher sought to identify the challenges that teachers face while using CSIP in teaching in secondary schools. The study gathered information using questionnaires, interview and observation schedules. The information was presented in subsequent sections.

4.8.1 The Challenges Physics Teachers Face Using CSIP in Teaching Physics

In this section study sought to identify the challenges physics teachers face using CSIP sims in teaching physics in secondary schools. Thus; five questionnaire items were used as depicted in table 4.14.

Table 4.14: The Challenges Physics Teachers Face Using CSIP in Teaching Physics

Statement	SD		D		N		A		SA	
	No	%	No	%	No	%	No	%	No	%
CSIP facilities are proportionate for all class sizes	24	40.4	23	38.3	1	2.1	9	14.9	3	4.3
Use of CSIP does not attract learner's attention in class	18	29.8	29	48.9	2	3.1	9	14.9	3	4.3
Our school has inadequate CSIP resources	14	31	14	19	2	3	31	9	11	15
Our school has trained laboratory assistants on use of CSIP	15	24.9	20	34.0	2	2.8	17	28.3	6	10.6
The school has adequate internet connectivity	15	25.5	27	44.7	2	3.3	13	21.3	3	4.3

Key: SD= strongly disagree; **D**= disagree; **N**= neutral; **A**= agree; **SA**= strongly agree

4.8.1.1 CSIP Facilities are Proportionate For All Class Sizes

This study showed 42 (78.7%) of the respondents disagreed that CSIP facilities are proportionate for all class sizes, 11 (19.2%) agreed while 1 (2.1%) were not decided. In this study, majority of the respondents disagreed that CSIP facilities are proportionate for all class sizes. Wamalwa &Wamalwa (2014) agrees with the findings of this study that large class sizes limit effective teaching and use of available teaching resources.

4.8.1.2 CSIP sims Does Not Attract Learner's Attention in Class

This study showed 42 (78.7%) of the respondents disagreed that CSIP sims does not attract learner's attention in class, 11 (19.2%) agreed while (2.1%) were not decided. In this study, the findings showed that majority of the respondents disagreed that CSIP sims does not attract learner's attention in class. The findings of this study showed that learners were attracted to the lesson whenever CSIP were used in teaching of physics in secondary school. Kibirige & Tsamago (2019) agrees on this finding that use of computer simulations simulates learners and improve learners' attitudes towards physics learning.

4.8.1.3 The School Has Inadequate CSIP Resources

The findings of this study showed 28 (51.8%) of the respondents disagreed that the school had inadequate CSIP sims, 24 (44.4%) agreed and 2 (3.7%) were not decided. This study revealed that majority of the respondents agreed that a school does not have sufficient CSIP sims and associated accessories in their schools.

In an interviewed conducted to Hops that sought on the availability of CSIP sims and the following were their responses:

HoPs reported that:

> "*The school has few CSIP and associated accessories to teach physics*. in our school" (as depicted by the respondent no.7)
>
> "*We do not have CSIP sims to conduct and aid our the teaching in our school*" (as depicted by respondent no.4)

The study found out that majority of HoPs hold the opinion that schools lack CSIP resources for use in teaching physics

4.8.1.4 The School Has Trained Laboratory Assistants on Use of CSIP

The findings of this study showed that 32 (58.9%) of the respondents disagreed that the school has trained laboratory assistants on use of CSIP sims, 20 (38.9%) agreed while 2 (2.8%) were undecided. This study found out that a majority of the respondents disagreed that schools has trained laboratory assistants to give a technical support to physics teachers. The schools principles employed laboratory assistants to provide technical support to physics.

An interview by laboratory assistants that sought to examine on the challenges physics teachers faced as they conduct their lessons using CSIP sims and the following were responses:

Laboratory assistants reported that:

> "*I have little knowledge on the use of CSIP to assist physics teachers*" (as depicted by the respondent no. 1)
>
> "*I do not have the necessary skill to assist physics teachers on use of CSIP in teaching of physics*" (as depicted by the respondent no. 24)
>
> "*I have no problem in assisting my physics teachers on the use of CSIP any time the lesson is conducted***"** (as per the respondent no. 5)

The findings of the study revealed that majority of the laboratory assistant do not have the necessary training on computer skills. This therefore poses a challenge to the technical assistance needed by the physics teachers as they conduct their lessons using CSIP sims. The inadequacy of skills on the side laboratory assistants could be attributed to the lack of in-service training. The changes in technology require schools to empower their staff the ever-changing computer technology to aid the delivery on clarity of information to the learners.

4.8.1.5 The School Has Adequate Internet Connectivity

The finding of this study showed 38 (70.2%) of the respondents disagreed that school has adequate internet connectivity, 14 (25.6%) agreed while 2 (3.3%) were undecided. This study found that majority of the respondents disagreed that the school had adequate internet connectivity. This study links the poor connectivity to the cost attached to installing and maintenance of the network. The internet availability is vital in accessing web based simulations attached to teaching of physics in secondary schools.

In an interview conducted head of physics that sought to establish the internet coverage in their schools and the following were their responses:

HoPS reported that:

> "*The school has a working internet infrastructure and has the capacity handle teaching using CSIP*" (as depicted by the respondent no. 4)
>
> "*The internet is not reliable in our school due to non-payments of bills accrued to sustain the networks*." (as depicted by respondent no. 1)
>
> "*Our school is not connected to internet"* (as depicted by respondent no. 6)

The findings of this study revealed that majority of secondary schools in Uasin Gishu County had limited internet connectivity.

The researcher sought from teachers interviewed recommendation on the challenges faced the internet connectivity and the following were the responses;

A teacher reported that:

> "*The schools administration should prioritize internet connectivity to be used in teaching of physics using CSIP*" (as depicted by respondent no. 7)

The findings on this research study established that majority of secondary schools suggested schools investment on the CSIP infrastructure to be installed their premises.

The researcher used check list to establish to extent internet connectivity supported the use of CSIP in teaching of physics in secondary schools. The findings showed that not more than 50% of the schools was connected to internet. These findings are supported by Howie, Muller & Paterson, (2005) who incriminated poor infrastructure for poor integration of ICT in teaching.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of the study that sought to examine the use of CSIP sims in teaching physics in secondary schools in Uasin Gishu County-Kenya. The study was guided by specific objectives and research questions. This chapter therefore presents the summary of findings the research work, conclusions drawn from the study, recommendations and suggestions of further research in relation to data analysis.

5.2 Summary of the Study

The study's primary objective was to investigate the use of CSIP in enhancing the teaching of physics in secondary school in Kenya's Uasin Gishu County. The study looked into the availability of CSIP, how physics teachers use it in the classroom in secondary schools in Uasin Gishu County, physics teachers' attitudes toward using CSIP in teachingof physics, the nature of technical support physics teachers receive from laboratory assistants, and the challenges teachers face when using CSIP in their lesson preparation enhancing the teaching of physics in secondary schools in Uasin Gishu County. According to the study, CSIP is utilized to teach physics in secondary schools in Kenya's Uasin Gishu County.

5.2.1 Availability of CSIP for Use in Teaching Physics in Schools

The findings of this study pointed out that the available CSIP rescource formed 44.6% of both PhET and myphysics lab sims for teaching physics in secondary schools in Uasin Gishu County. The most common instructional packages were PhET sims followed by myphysics lab sims packages. Web-based sims package was least available at 8%. A checklist conducted on available CSIP sms, and the finding of the study showed 55.4% did not have CSIP sims in their schools. Interviews were conducted on schools Hops to establish the availability of CSIP sims, and the findings of the study showed that majority of the schools did not have an adequate CSIP sims.

The web-based inadequacy secondary schools could be contributed to limitation to the internet connectivity. The findings of this study pointed out that majority of secondary schools had inadequate CSIP sims for use in teaching physics in secondary school in Uasin Gishu County.

5.2.2 The Use of CSIP by Physics Teachers Teaching in Secondary Schools

The findings according to this study showed that, 43.2% of physics teachers in Uasin Gishu County use CSIP sims to teach physics in secondary schools. The study also sought to find out CSIP sims types that are used to conduct form two syllabus and findings of the study showed that, PhET sims at 55% and Myphysics lab sims at 33%. The study sought to examine the frequency use with CSIP sims by physics teachers and the findings of this study showed that majority rarely use them. The reason to the unpopular use of CSIP sims could attribute to inadequacy and availability to its associate accessories.

The interview that was conducted on Hops that sought the use of CSIP sims in teaching physics, found out that majority of the secondary schools had inadequate CSIP sims. The study revealed that teachers felt use CSIP sim behind due to the CSIP sims limitations and its associated accessories.

An observation that was made on a live classroom physics lesson revealed that majority of physics teachers used CSIP sims to perform emphasis on the knowledge that was earlier taught and act as motivational tool in learning the subject. However, the findings of this study observed that the use of CSIP could give clarity to difficult physics concepts. Thus, this study found that secondary schools using CSIP sims as instructional tool felt motivated to enhance the academic standards of their learners.

5.2.3 The Attitudes of Physics Teachers Towards The Use of CSIP In Enhancing The Teaching of Physics in Secondary Schools.

This study revealed that 65.9% physics teachers were confident to use CSIP as mode of instruction in teaching of physics in their secondary schools. This could be attributed to secondary schools physics teachers had high grades to be educated through universities. This study therefore found out majority of physics teachers were armed the right training to teach using CSIP sims in their schools. The findings of the study revealed that 55.3% of physics teachers agreed that CSIP was suitable for physics concept explanation. The problem with physics is that students find difficulties in conceptualizing concepts and that requires use of other teaching tools to understand. This study therefore sought the use of CSIP sim to sort the problem. This study also pointed out that 53.2% of physics teachers agreed that it takes a long time to prepare a lesson using CSIP sims. The use of CSIP is technical in nature and the technology may fail midway or in the process of setting up lesson where laboratories are not constructed specifically for teaching using CSIP. The findings of the study found that 53.2% of physics teachers felt that use of CSIP sims does not prolong the duration allocated for the lesson. This study noted the use of technology to make processes move faster and so to teaching using CSIP technology is quicker in its operations.

From the findings of this study it is showed that a higher percentage of teachers were comfortable in using CSIP sims in teaching of physics that depicted optimism towards utilization of CSIP sims by the teachers. Therefore, the use of CSIP sims should be highly enhanced for teaching physics in secondary schools.

5.2.4 The Nature of Technical Support Physics Teachers Get in The Use CSIP In Enhancing The Teaching of Physics In Secondary Schools

According to the study 53.2% of the physics teachers were in agreement that lack laboratory assistant's support during lesson preparation limits the use of CSIP sims due to aspect of equipment involved. The findings of this study showed that 53.2% of laboratory assistants have not been empowered through in-service training to give physics teachers support in the use of CSIP sims. The study also revealed that 57.3% of respondents agreed that laboratory assistants were not familiar with CSIP associate accessories give support to the teachers. Lastly, this study noted that 53.2% of the physics teachers agreed that they cannot work alone without the support from laboratory assistants.

An interview conducted that sought to examine the status of laboratory assistant's attendance to in-service training, and this study found out that majority of laboratory assistants had not been trained in computer applications skills. This limitation could attribute to the schools lack of budgetary allocations staff empowerment. This study would encourage the empowerment of laboratory assistant's to avoid a negative impact in the use of CSIP sims in teaching physics in secondary schools

5.2.5 Challenges Teachers Face in Use in enhancing the teaching of physics in Secondary Schools

According to this study 78.7 % of CSIP sims were not proportionate with the large class population. This meant that a high number of students would use one facility at ago and these gave teachers a challenge in addressing the needs of individual student.

The study also established that 54% of secondary schools lacked CSIP sims and therefore their teachers were disadvantaged in the use of modern technology in enhancing their practice. The finding of this study showed schools that are not connected to internet form 70.2%. The findings study showed that 58.3% of the secondary schools laboratory assistants did not attend in-service training and this could be the reason majority of physics teachers lacked technical support so needed to carry out a successful use of CSIP in teaching physics. An interview was conducted to ascertain the availability of CSIP resources and the study showed that the majority of the teachers confirmed that there was a limitation of resources. The study found that felt that laboratory assistants were not adequately trained on skills to assist in use of CSIP in teaching of physics.

5.3 Conclusion

This study found out that majority of the secondary schools in Uasin Gishu County described availability of CSIP sims as inadequate. The findings also showed that teachers felt that CSIP sims were inadequate with respect to the types of packages available and the type best suited for use**.** The CSIP Sims available for teaching physics were found to be in the the following categories : PhET sims, myphysics lab sims and web-based sims. The web-based sims were least used in teaching physics due to the limitation in internet connectivity. Though CSIP Sims were available in some schools in Uasin Gishu County, majority of physics teachers partially use them. Majority of the physics teachers were comfortable to use CSIP Sims because of the training they acquired in colleges and universities. The use of CSIP sims would therefore be encouraged by physics teachers to improve on school's academic achievements. The findings of study showed that majority of secondary schools had insufficient trained laboratory assistants. The majority of physics teachers also agreed that the nature of technical support they get from laboratory assistants were insufficient. The presence of laboratory assistants would of necessity to offer help due to the aspects of the technology and save handling of the CSIP infrastructure involved.

This study pointed out that the challenges encountered in the use of CSIP Sims were: use of CSIP in teaching of physics was not proportionate with the large class population, which showed that a large students numbers would share single facility, that majority of secondary schools lacked CSIP sims and associated accessories, majority of the secondary schools did not have trained laboratory assistants and hence physics teachers were starved with the needed support during lesson preparation, and majority of secondary schools had inadequate internet connectivity. Similarly, the study established that the respondents agreed that there exist challenges on*:* the availability of CSIP sims and inadequate internet connectivity and laboratory assistants were inadequately trained to help in use CSP sims.

The current study holds that CSIP sims usage would contribute to an enhanced academic performance in Uasin Gishu secondary schools and subjecting any teaching factors constant.

5.4 Recommendations

These are some recommendations based on the study's findings:

1. The principals and secondary school managements should invest on adequate internet infrastructure and purchase the required CISP Sims to enhance the teaching of physics in secondary schools.

2. The physics teachers should be facilitated with enough CSIP sims and the associated infrastructure in enhancing the teaching of physics in secondary schools.
3. The school principals should motivate physics teachers to hold positive attitude towards the use of CSIP sims in enhancing the teaching of physics in secondary schools.
4. The school principals should empower laboratory assistants with necessary computer skills and knowledge to provide technical support required by physics teachers.
5. The school principals should invest on sufficient internet connectivity and possible put up independent laboratory.

5.5 Suggestion for Further Research

The study should also expand on the following topics:

1. Similar studies to be done in other science related disciplines in secondary schools in the county or beyond for comparison purposes in preparation for digital curriculum presentations.
2. Effects on the performance outcomes conducted on use of CSIP and the schools that is not subjected to CSIP in teaching of physics in secondary schools.
3. The student's and teachers attitudes towards the use CSIP in teaching of physics in secondary schools.
4. The role of secondary school management supports the use CSIP sims in teaching physics in secondary schools.
5. The suggestion for overcoming challenges in the use of CSIP in teching physics in secondary schools.

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APPENDICES

Appendix I: Questionnaire For Physics Teachers

TEACHERS' QUESTIONNAIRE

The purpose of this questionnaire is to find out the use of CSIP in enhancing the teaching of physics in secondary schools in Uasin Gishu County. Each section has been designed with instruction on how to fill them kindly adhere to them. All information provided will be treated with confidentiality and used only for the purpose of this study.

SECTION A: Demographic Information

Please indicateby ticking (√) your chosen response where appropriate.

1. Please indicate you Gender

    Male ( ) Female ( )

2. Indicate your age bracket

    20 – 30 years ( ) 31 – 40 years ( ) 41 - 50 years ( ) over 50 years ( )

3. What is your highest professional Qualification?

    S1 ( ) Diploma ( ) Bachelors' Degree ( ) Masters ( )

4. Indicate the number of years of experience in teaching usings CSIP sim in teaching of physics

    More than 14 ( ) Between 10-14 ( ) between 5-9 ( ) Between 2-4 ( ) below 2 ( )

5. Have you attended any in service training on computer simulation?

    Yes ( ) No ( )

SECTION B: Availability of CSIP software for use in teaching physics

6. Indicate by ticking (√) the availablecomputer instructional software packages simulators in teaching of physics subject in your school?

No.	Software Packages	Available	Not Available
1	PhET sims		
2	Web-Based sims		
3	Myphysics lab sims		

7. How often do you use CSIP sims in teaching physics in your school? ……………………………………………………………………………

8.The Form II physics syllabus listed below,indicate by ticking (√) CSIP sims available in your school.

Form II Physics Syllabus	Packages					
	PhET ims		My physics Lab sims		Web Based	
	Available	Not Available	Available	Not Available	Available	Not Available
Properties of matter						
Magnetism						
Magnetic effect of an electric current						
Force and Moment II						
Linear motion						
Work, energy, power/machines						
Waves I						
Sound I						

SECTION C: Use of CSIPin Teaching Physics

9.Indicate by ticking **(**√**)** the appropriate response on the given key, how you agree with the following statement on usingCSIP in teaching physicsin your school?

Key: [5] Strongly agree[4] Agree [3] Undecided [2] disagree [1) Strongly disagree

NO	**USE OF COMPUTER SIMULATORS**	5	4	3	2	1
1	Use of CSIP raises learners attention in class					
2	Use of CSIP takes a short time cover a lesson					
3.	CSIPis not suited for physics concept explanation					
4.	Topics that are difficult are done using CSIP					
5.	Use of CSIP relays on the power supply to take place					
6.	Laboratory assistant must be present to facilitate the use CSIP					
7.	Internet connectivity is not required to facilitate use of CSIP.					

SECTION D: Attitude of Physics Teachers Towards The Use of CSIP in Enhancing The Teaching of Physics

10. Indicate by ticking (√)the appropriate response on the given key, on your attitude as a teacher towards the use of computer simulation in teaching physics in your school?

Key: [5] Strongly agree (daily) [4] Agree [3] Undecided [2] disagree [1) Strongly disagree

NO	TEACHERS' ATTITUDES	5	4	3	2	1
1	I prefer teaching without support of CSIP sims					
2	Use of CSIPwill require teachers to attend in-service training					
3.	Use of CSIP prolongs lesson period					
4.	Using CSIP takes a long of time for lesson preparation					
5.	Using CSIP is not suitable forphysics concept explanation					
6	Overcrowded classes makes CSIP in eneffective					

SECTION E: Nature of Technical Support Physics Teachers Gets in The Use Of CSIP in Enhancing The Teaching of Physics

12. Indicate by ticking (√) the appropriate response on the given key on the nature of technical support you receive as a physics teacher in the use of computer simulation in teaching in your school?

Key: [5] Strongly agree [4] Agree [3] Undecided [2] Disagree [1) Strongly disagree

NO	TECHNICAL SUPPORT	5	4	3	2	1
1	Lack of laboratory assistant to help teache rsusing computer simulation					

2	The laboratory assistant has the skills to maintain of ourcomputer equipment					
3.	Laboratory assistant is not familiar with CSIP associated accessories					
4.	I can teachusing CSIP without help from laboratory assistant					

SECTION F: Challenges Teachers Face in The Use CSIP in Enhancing The Teaching of Physics

13. By ticking **(**√**)**the appropriate response on the given key, on the challenges you face as a teacher in using CSIP in the teaching physics in your school?

Key: [5] Strongly agree (daily) [4] Agree [3] Undecided [2] Disagree [1) Strongly disagree

NO	**CHALLENGES**	5	4	3	2	1
1.	CSIP are proportionate tofor all class sizes					
2.	Use fo CSIP does not excite learners attention in class					
3	Our school has inadequate CSIP resources					
4.	Our school has trained laboratory assistants on use of CSIP					
5.	The school has adequate internet connectivity					

THANK YOU

END

Appendix II: Interview Schedule For Laboratory Assistant

1. Have you gone to any training on the use CSIP in your school?
2. What is your role when physics teacher uses CSIP in your school?
3. Do you have the skillsand knowledge to repair and maintain CSIP facilities in your school?
4. Do you have the accessibility to internet facilityfor the purposes teaching physics of CSIP in your school?
5. What areyour challenges that limits you from assisting physics teachers on the use of CSIP in your school?

Appendix III: Interview Schedule For Head Of Physics

1. Do you have prerequisite skills and knowledge on the use of CSIP in teaching physics?
2. What are the available packages used in teaching of physics in your school?
3. Is your school connected to internet?
4. What is your role in use of CSIP in your school?
5. What are the challenges that limits the use of CSIP in teaching of physics in your school?
6. Suggest any recommendations to the challenges on the use of CSIP in your school?

Appendix IV: Observation Schedule

OBSERVATION SCHEDULE

Upon visiting the schools, the researcher will seek to make the following observations.

1. Category of the school. ………………………………………………………..

2. Indicate by commenting upon the statements as the lesson is in progress.

S/No	**Class:**	**Date:**
	Topic: **Sub Topic:**	**Time:**
		Duration:
	Classroom Observation	**Comments**
1	Check on the availability types of CSIP sims used	
2	Observe teachers lesson plan on use of CSIP	
3	Check on learners activities	
4	Check on the laboratory assistant activities	

THANK YOU

END

Appendix V: Check List

Upon visiting the schools, the researcher will seek to make the following observations in the schools.

1. Category of the school. ……………………………………………………………..

2. If there is electricity supply and a generator for power back up.

3. Presence of other telecommunication facilities by checking Store ledgers, inventories to establish the availability, quantity, condition of the listed computer simulationinstructional packages facilities.

	Simulation Equipment	**Availability**
		Comment
1.	Computer software (CSIP)	
2.	Internet connectivity	
3.	Computer laboratory	

THANKS

END

Appendix VI: Map of Showing Study Area; Uasin Gishu County

Source(ROK., 2012)

Appendix VII:Table For Determining Samplesize From A Given Population

N	S	N	S	N	S	N	S	N	S
10	10	100	80	280	162	800	260	2800	338
15	14	110	86	290	165	850	265	3000	341
20	19	120	56	300	169	900	269	3500	246
25	24	130	97	320	175	950	274	4000	351
30	28	140	103	340	181	1000	278	4500	351
35	32	150	108	360	186	1100	285	5000	357
40	36	160	113	380	181	1200	291	6000	361
45	40	180	118	400	196	1300	297	7000	364
50	44	190	123	420	201	1400	302	8000	356
55	48	200	127	440	205	1500	306	9000	368
60	52	210	132	460	210	1600	310	10000	373
65	56	220	136	480	214	1700	313	15000	375
70	59	230	140	500	217	1800	317	20000	377
75	63	240	144	550	225	1900	320	30000	379
80	66	250	148	600	234	2000	322	40000	380
85	70	260	152	650	242	2200	327	50000	381
90	73	270	155	700	248	2400	331	75000	382
95	76	270	159	750	256	2600	335	100000	384

Source: Determining sample size for research activities: Krejie and Morgan table, 1970.

Appendix VIII: Letter of Introduction From Moi University

FOUNDATION OF KNOWLEDGE

MOI UNIVERSITY

Office of the Dean School of Education

Tel. Eldoret (053) 43001-8/43620
Fax No. (053) 43047

P.O. Box 3900
Eldoret, Kenya

REF: EDU/SoEd/PGS/54 **DATE:** 27th June, 2018

The Executive Secretary
National Council for Science and Technology
P.O Box 30623-00100
NAIROBI

Dear **Sir**/Madam,

RE: RESEARCH PERMIT IN RESPECT OF KOILEGE WILSON KIPTOO – EDU/PGT/1005/15

The above named is a 2nd year Master of Education (M.Ed) student at Moi University, School of Education, Department of Technology Education.

It is a requirement of his Master of Education (M.Ed) Studies that he conducts research and produces a thesis. His research is entitled:

"Use of Computer Simulation in Teaching Physics in Secondary Schools in Uasin Gishu County-Kenya."

Any assistance given to enable him conduct research successfully will be highly appreciated.

MOI UNIVERSITY
SCHOOL OF EDUCATION
JUN
P. O. Box 3900 - 30100, ELDORET

Yours faithfully,

PROF. J.K. CHANG'ACH
DEAN, SCHOOL OF EDUCATION

Appendix IX: Nacosti Research Authorization

NACOSTI

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

NACOSTI, Upper Kabete
Off Waiyaki Way
P.O. Box 30623-00100
NAIROBI-KENYA

Ref: No **NACOSTI/P/18/98624/25262**

Date: **18th October, 2018**

Wilson Kiptoo Koilege
Moi University
Po Box 3900-30100
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on ***"Use of computer simulation in teaching physics in secondary schools in Uasin Gishu County."*** I am pleased to inform you that you have been authorized to undertake research in **Uasin Gishu County** for the period ending **17th October, 2019.**

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

Kindly note that, as an applicant who has been licensed under the Science, Technology and Innovation Act, 2013 to conduct research in Kenya, you shall deposit **a copy** of the final research report to the Commission within **one year** of completion. The soft copy of the same should be submitted through the Online Research Information System.

BONIFACE WANYAMA
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner
Uasin Gishu County

The County Director of Education
Uasin Gishu County

Appendix X: NACOST Research Permit

THIS IS TO CERTIFY THAT:
MR. WILSON KIPTOO KOILEGE
of MOI UNIVERSITY, 3900-30100
ELDORET,has been permitted to conduct
research in *Uasin-Gishu County*

Permit No : NACOSTI/P/18/98624/25262
Date Of Issue : 18th October,2018
Fee Recieved :Ksh 1000

on the topic: *USE OF COMPUTER SIMULATION IN TEACHING PHYSICS IN SECONDARY SCHOOLS IN UASIN GISHU COUNTY.*

for the period ending:
17th October,2019

....
Applicant's Signature

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

Appendix XI: Plagiarism Certificate

SR021

EDU 999 THESIS WRITING COURSE

PLAGIARISM AWARENESS CERTIFICATE

This certificate is awarded to

KOILEGE WILSON KIPTOO

EDU/PGT/1005/15

In recognition for passing the University's plagiarism awareness test with a similarity index of 1% and striving to maintain academic integrity

Awarded by:

Prof. John Changách, CERM-ESA Project Leader

Date: 12/11/2021