

**INFLUENCE OF SCHOOL-BASED FACTORS ON INTEGRATION  
OF INFORMATION COMMUNICATION AND TECHNOLOGY IN  
TEACHING AND LEARNING IN PUBLIC SECONDARY SCHOOLS  
IN KINANGOP SUB-COUNTY, NYANDARUA COUNTY, KENYA**

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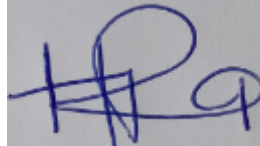
**A Research Project Report Submitted in Partial Fulfillment of the  
Requirements for the Award of the Degree of Master of Education in  
Curriculum Studies**

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## DECLARATION

This project report is my original work and has not been presented for a degree in any other university



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**E55/6652/2017**

This research project has been presented with our approval as university supervisors.



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## **DEDICATION**

This project is dedicated to my parents Mr. Moses Mwaura, Mrs. Serah Mwaura, my siblings, David Kabiro, Priscillah Murugi and Ann Wanjiru.

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## **LIST OF ABBREVIATIONS AND ACRONYMS**

<b>CDF</b>	Constituency Development Fund
<b>CFSK</b>	Computer for Schools Kenya
<b>ESP</b>	Economic Stimulus Programme
<b>GOK</b>	Government of Kenya
<b>ICT</b>	Information Communication Technology (ICT)
<b>KICD</b>	Kenya Institute of Curriculum Development
<b>MoEST</b>	Ministry of Education, Science and Technology
<b>NACOST</b>	National Commission for Science, Technology and Innovations
<b>I</b>	
<b>NGO</b>	Non-governmental organization
<b>QASO</b>	Quality Assurance and Standards Officers
<b>QASO</b>	Quality Assurance and Standards Officers
<b>SAS</b>	Support Application Systems
<b>SPSS</b>	Statistical Package for Social Sciences
<b>TPACK</b>	Technological Pedagogical Content Knowledge
<b>TVET</b>	Technical and vocational education and training
<b>UNESCO</b>	United Nations Educational, Scientific and Cultural Organization

## ABSTRACT

The aim of this research was to explore the impact of school-related factors on the incorporation of information communication and technology (ICT) into the educational process within public secondary schools located in Kinangop Sub-County, Nyandarua County, Kenya. The study focused on four primary research objectives: firstly, to assess the effect of teachers' competence on the integration of ICT in teaching and learning in public secondary schools; secondly, to investigate the attitudes of teachers towards the integration of ICT in teaching and learning in these schools; thirdly, to identify the various methods through which ICT instructional materials contribute to the integration of ICT in teaching and learning within public secondary schools; and finally, to analyze the influence of ICT infrastructure on the integration of ICT in teaching and learning in public secondary schools situated in Kinangop Sub-County, Nyandarua County, Kenya. The research employed a descriptive research design and its scope encompassed 30 school principals, 365 teachers, 1 Director of Education for the Sub County, 1 Quality Assurance Officer for the Sub County, and 3,078 students in their fourth year of education (Form Four) within Kinangop Sub-County, Nyandarua County, Kenya. The sample was composed of 30 principals, 109 teachers, and 308 students who were selected from specific secondary schools located in Kinangop Sub-County. The tools employed for data collection included questionnaires and an interview guide. The validity of the instruments was established by gathering expert opinions from university supervisors, while their reliability was assessed through the test-retest method. Both descriptive and inferential statistical methods were employed in this study, encompassing correlation tests, analysis of variance, and regression analysis for the quantitative data. For the qualitative data, descriptive statistics such as mean and standard deviation were utilized, with results being presented in terms of frequencies and percentages. The analysis of the data was conducted using Statistical Package for the Social Sciences version 23.0. The primary findings of this research highlight that teachers' competency, teachers' attitude, ICT instructional materials, and ICT infrastructure collectively exert a positive influence on the integration of information communication technology in the teaching and learning process. In summation, this study underscores that the integration of information communication technology in education is a result of the interplay between teachers' competency, teachers' attitude, ICT instructional materials, and ICT infrastructure. The study suggests that the Ministry of Education and relevant policy makers, such as the Kenya Institute of Curriculum Development (KICD), should seriously consider incorporating ICT as a fundamental subject within the secondary school curriculum. This integration of ICT as a core subject would have the potential to enhance students' attitudes towards ICT, as it would be regarded as equally essential as their other academic subjects. To further this initiative, school principals and Boards of Management (BOM) should actively encourage the infusion of ICT skills, encompassing networking, pedagogy, technical aspects, and social

considerations. This holistic approach is crucial for establishing ICT competence, ultimately leading to more effective computer utilization.

## **CHAPTER ONE**

### **INTRODUCTION**

#### **1.1 Background to the Study**

The adoption of Information and Communication Technologies (ICT) into education stands as a critical concern for any nation, given the sweeping changes occurring globally. As stated by Alazzam, Bakar, Hamzah, and Asimiran (2012), ICT serves as the principal instrument for progress in the 21st century, enabling advancements with rigor. Technology facilitates remote learning, allowing easy communication among students, academic personnel, and non-academic staff, both officially and unofficially. Consequently, ICT's influence on the caliber and volume of teaching and learning is substantial (Alazzam et al., 2012).

The society is highly depending on information for progress and development with Knowledge on ICT as the main driving force. Daily usage of ICT include, online reading of newspapers, booking of planes, browsing on internet, sending of e-mails, accessing e-books, e-library, and digital repository among other uses. This requires human resource with the ICT capabilities, imaginative, creative and critical thinking individuals who can enable effective and efficient learning of the current knowledge (Al-Hariri, Mohammed and Abdulghani, 2017).

Around the world, numerous governments have initiated investments in Information and Communication Technology (ICT) with the aim of



improving classroom instruction. A clear illustration of this trend can be seen in the United Kingdom, where an expenditure of £2.5 billion was allocated to educational ICT during the years 2008–2009, as noted by Nut in 2010. Similarly, in the United States of America, governmental spending on K–12 education amounted to \$6 billion in 2009, with an additional \$4.7 billion allocated to higher education. In another context, the government of New Zealand dedicates \$410 million annually to enhance ICT infrastructure within its school system, as highlighted by Nut in the same source. This underscores the importance of integrating ICT within classrooms, emphasizing the need for its incorporation.

Use of ICT for instruction especially in Geography instruction aids in simulating and modeling geographical environments, enable creation of online classes, motivates the students. It also helps in solving the challenges of shortage of teachers and of high teachers' workload. As a result, many nations all over the classroom instruction, though they are faced with various challenges (Kent & Philips, 2019).

Because of teachers' reluctance to embrace ICT integration and the widespread corruption among top management in the education system, educators in Bangladesh have been hesitant in embracing and utilizing ICT for teaching purposes (Arkorful & Aboagye, 2021). In Germany, the incorporation of ICT into pedagogy within relevant technology-oriented subjects has been incomplete due to a scarcity of qualified instructors for ICT

integration (Kent & Philips, 2019). While teachers must possess knowledge and skills, their attitude plays a crucial role in the effective adoption of ICT, as highlighted by the findings of the International Education Studies in 2012.

Marinas and Ditapat (2011) in their examination of curriculum development in the Philippines discovered that comprehensive training and orientation are provided to supervisors and school teachers. This meticulous preparation is aimed at ensuring the successful implementation of the curriculum. The researchers highlighted that by enhancing teachers' capabilities, they are equipped with the necessary professional development to adeptly handle various changes. Sahlberg (2010) pointed out that the absence of teacher advancement initiatives in the Finnish Republic had repercussions on the incorporation of ICT into educational processes.

Rastogi and Malhotra (2013) contend that achieving desirable results of ICT in education necessitates the recognition by a nation's governing body responsible for implementing the innovation, of the importance of fostering teacher proficiency in ICT integration. This emphasizes the requirement for providing teachers with training in incorporating ICT into their teaching methods, ensuring a harmonious amalgamation of conventional pedagogy with cutting-edge ICT advancements.

For example, in Syria, the primary hindrance to the incorporation of ICT is the inadequate technological proficiency among instructors (Albirini, 2016). Similarly, within Saudi Arabia, a key barrier towards adoption of technology in science education is the deficiency of ICT skills (Al-Alwani,

2015). The Malaysia Education Blueprint (2013–2025) delineates the Ministry's strategies to leverage ICT for the enhancement of quality education across the Malaysian educational landscape. This blueprint acts as a foundation for the Ministry of Education to cultivate a digitally literate workforce, equipped with critical thinking abilities, and fully prepared to participate in the global economy of the twenty-first century (Ghavifekr & Sani, 2015).

Nevertheless, in economically disadvantaged countries, particularly within Africa, numerous barriers impede the realization of the benefits associated with incorporating ICT in education. The ratio of one computer for every 150 students in contrast to one computer for every fifteen students in developed nations underscores the considerable obstacle that limited access to ICT infrastructure poses for most African nations (Andiema, 2015). The presence and reach of ICT resources in Sub-Saharan Africa wield substantial influence over the determination to infuse ICT utilization into educational institutions.

As per the Botswana Education and Training Strategic Sector Plan 2015-2020 (Botswana Government, 2015), for the state to develop a positive setting for the utilization of ICT in educational activities as well as the running of institutions, it must supply the institutions with internet, create and enforce e-content and adopt the same at all learning levels as a standard educational requirement.

The thinking is that this creates an education platform where the teaching staff and the institutional leadership proactively apply ICTs during teaching and in management roles and a result entrenching e-learning as a standard educational requirement.

In Tanzania, integration of pedagogy, content and technology in teaching has been a challenge to most teachers. Teachers have the content knowledge, but most teachers have a challenge of integrating content, pedagogical and technological knowledge for effective teaching and learning. As a result the government brought the TPACK framework into the country's policy of basic education. TPACK framework is aimed at increasing teachers' uptake of English and science subjects. In addition, the country faces other challenges such as, inadequate computer gadgets and shortage of electricity supply among other challenges (Malekani & Andrew, 2018).

Uganda as a country has enormous advocacy for ICTs in teaching and learning coupled with donations for equipment. The country launched its first National ICT policy in 2003 and in the same year, presented an education sector ICT policy before parliament for approval. Emphasis was placed on the significance of adopting ICT in educational processes (Uganda Communications Commission, 2014). It is important for 21st century teachers to be sound pedagogically and confident users of ICTs in their educational activities. Teachers in Uganda, similar to many other countries in the developing world, are grappling with being ICT literate and competent (Hite,

& Mugimu, 2013). These challenges are partly due to constraints related to skills, expertise, finance, and computer equipment (Assimwe & Byenzi, 2017).

In the field of education, it has become evident that the use of ICT could play a significant role in complementing traditional methods of teaching and learning. Many learning institutions have come to embrace ICT in lesson preparation, lesson presentation, researching for teaching and learning materials on the web and even using ICT devices such as calculators to hasten the learning process. It is therefore clear that ICT will impart teachers and learners with tools and materials that would help them make the teaching-learning exciting and lively. Research indicates that ICT (Information and Communication Technology) can significantly enhance the processes of education. It equips educators with valuable tools to enhance their teaching methods, while also granting learners the opportunity to engage with electronic media that enhances their comprehension of complex concepts (Irungu et al., 2015).

To jumpstart the initiative of ICT adoption in educational activities, the government rolled out two major initiatives, that is, the economic stimulus programme (ESP) ICT initiative (Republic of Kenya, 2013). The objectives of the policies are to kick start the adoption of ICT in the education sector in line with Vision 2030 in order to produce a highly skilled human resource base that has ICT skills. Already, computer studies subject is an examinable subject at the secondary level. Several subjects at the secondary school level directly incorporate ICT in teaching and learning activities (Republic of Kenya, 2013).

Outlined within its ICT Strategy, the Ministry of Education, Science and Technology (MoEST) acknowledges the abundance of ICT innovations available to enhance the quality and efficacy of educational services and curricula delivery. However, a notable gap exists within educational institutions regarding the adoption of ICT into their educational approaches. Many institutions persist in utilizing outdated systems, thereby missing out on the educational possibilities offered by modern innovations (MOE, 2016).

Most Kenyan schools are connected to electricity through the government rural electrification project. The schools have also received computers through; CDFs, NGOs and through the school's own means. Equipping the schools with ICT equipment, a survey by the Kenya Institute of Curriculum Development (KICD, 2018), revealed that most learning institutions had computers, laptops, and tablets, but were rarely integrating ICT in their educational processes. Teachers' ICT illiteracy and bias towards ICT were some of the factors attributed to low application of ICT in institutions (Ngwacho, 2019). Mwendwa (2018), view that integration of ICT in teaching and learning fails due to the government top down approach where most reforms and policies in education are made and implemented without consideration of the teachers' perception, attitude, and relevant knowledge.

Anyango (2019) observed that use of PowerPoint presentations including videos increasing students' participation in class. Kenya national examination report of 2020 on Geography papers affirms Anyango's (2019) findings as the report recommended that Geography teachers should

incorporate ICT into teaching of abstract Geographical concepts such as land forming processes, internal structure of the Earth, the solar system among other concepts. According to the report, use of ICT would lead to a shift from teacher centered learning (knowledge dissemination) to learner centered learning (knowledge creation) (KNEC report on Geography paper,2020, pp.15 & 20).The importance of learning Geography in secondary schools in the 21<sup>st</sup> century society should not be ignored as it forms a basis for further study leading into geography related careers such as climate change analyst, geomorphology, soil conservationist and climatology among other careers which may help in solving today's challenges of global warming, among other challenges ( Mwanda, Midigo & Maundu, 2017).

Moreover, the Sessional Paper No. 1 of 2005 (the Republic of Kenya, 2005) recognized the contribution ICT has in the promotion of a nation's economic development. The suggestion by the report is that it possible to utilize ICT in education, training of staff and research. This became a reality during the physical closure of schools during the Covid -19 pandemic.

For over fifteen years, the Kenyan Government has been keen to utilize ICT with little success. The Kenyan Government have funded the design and development of e-government strategy, out of which an ICT policy was developed which. To ensure use of ICT for instruction in secondary schools, the government has devoted huge amounts of money for purchase of ICT gadgets, for example, through the computer for School Project (CFSP) which

led to distribution of several computers to public secondary schools in addition to training of 300 trainers and 180 ICT champions (KEMI, 2019).

The Sessional Paper No.1 of 2019 (Republic of Kenya, 2019) identified some challenges facing the ICT integration in educational institutions. These include inadequate ICT equipment, lack of or poor internet connectivity, unreliable power supply, inadequate or outdate digital content, high costs of maintaining ICT tools and services, negative attitude towards technology, and inadequate ICT integration among educators.



**Table 1. 1: Schools that have Integrated of ICT in Educational Activities in Nyandarua County**

Sub-County	Number of schools	Number of schools with limited ICT facilities	Percentage
Kipipiri	38	18	47.36%
Kinangop	30	22	73.33%
Ol Joro Orok	27	8	29.62
Ndaragwa	24	11	45.83

**Source: Kinangop Sub-County Education Office (2019)**

The data presented in Table 1.1 illustrates an ongoing deficiency in the adoption of ICT for educational activities within Kinangop Sub-County. The motivation for conducting this research arises from the need to investigate school-related variables that affect the incorporation of ICT in secondary schools, which has not been previously documented.

The situation in Kinangop Sub-County is not of any difference in relation to availability of ICT equipments and electricity supply in schools. Most schools are equipped with ICT facilities such as computers and projectors through government projects, CDFs, NGOs and the schools own means , however, the ICT equipments are mostly used for administrative purposes and entertainment in schools rather than for teaching ( Mwanda et.al, 2017).

Hence, the primary objective of this study was an assessment of proficiency levels exhibited by educators in utilizing ICT tools, the extent of

their access to these tools, and their contribution to the educational processes. Furthermore, the study aimed to ascertain instructors' bias towards the utilization of ICT apparatus for implementing curriculum initiatives and how the existing infrastructure impacted the integration of ICT in secondary schools situated in Kinangop Sub-County.

## **1.2 Statement of the Problem**

In spite of the extensive backing for incorporating ICT in improving educational activities, coupled with the contributions and grants of ICT tools to secondary schools by diverse international bodies, educational institutions continue to confront the obstacle of reshaping the learning approach for students. This adaptation is crucial to equip them with the essential proficiencies for triumphing in this fast-paced, knowledge-abundant, and perpetually evolving setting. The cause for apprehension stems from the fact that without addressing this concern, the financial resources injected into the advancement of ICT in secondary schools might end up squandered.

While there have been manifold advancements in ICT aimed at enhancing the efficient and top-notch conveyance of educational offerings and syllabi, the Ministry of Education, Science and Technology (MoEST) highlights in its ICT Strategy that educational establishments still have a considerable distance to cover in terms of incorporating ICT into their instructional approaches. Given that a majority of institutions persist in their dependence on obsolete technology, they find themselves incapable of

harnessing the complete educational capabilities offered by more modern technologies (MoEST, 2016).

Data from the Kinangop Sub-County Education Office (2019) point to the adoption of ICT in public secondary schools remaining significantly low. This suggests that the effective implementation of the 2017 National ICT policy on education has not unfolded as initially projected.

In addition, the KNEC 2020 report, recommended use of ICT for instruction due to its various benefits such as increasing students' retention of concepts among other benefits, failure to use ICT would disadvantage geography students as they would not be able learn from simulated geographical contents through videos like other students whose teachers use ICT and this may lead to low mastery of concepts leading to scoring of poor grades. This may discourage students from enrolling for related courses such as climatology and meteorology among others, which are very essential in solving today's environmental challenges such as global warming.

Government initiatives aimed at fostering the integration of Information and Communication Technology (ICT) into educational practices have been implemented, facilitated through the Ministry of Education. To illustrate, the Intel-Teach Getting Started Course strives to enhance educators' foundational computer competencies, incorporation of ICT within the classroom, and the adoption of contemporary pedagogical approaches. Furthermore, the Computer for Schools Kenya (CFSK) project lends its support by advocating for the maximal utilization of ICT in teaching and

learning across all educational institutions, as indicated by the Computer for Schools Kenya publication in 2018. Despite concerted efforts made by Kenya and Nyandarua County, Kinangop Sub-County's secondary schools still lag behind in terms of integrating ICT. The Kinangop Sub-County education office's report from 2019 affirms this observation. Given this particular circumstance, a research study was carried out with the aim of evaluating the influence of school-based variables on the integration of Information, Communication, and Technology (ICT) into the process of teaching and learning. This research was conducted in public secondary schools located in Kinangop Sub-County, Nyandarua County, Kenya.

### **1.3 Purpose of the Study**

The aim of this study was to examine how school-based factors impact the incorporation of information communication and technology into the teaching and learning processes within public secondary schools situated in Kinangop Sub-County, Nyandarua County, Kenya.

### **1.4 Research Objectives**

The objectives of this study were: -

- i) The aim is to evaluate how teachers' competency affects the incorporation of ICT into teaching and learning at public secondary schools in Kinangop Sub-County, Nyandarua County
- ii) The goal is to appraise how teachers' attitudes impact the incorporation of ICT into teaching and learning at public secondary schools in Kinangop Sub-County, Nyandarua County

- iii) The objective is to investigate how ICT instructional materials sway the incorporation of ICT into teaching and learning at public secondary schools in Kinangop Sub-County, Nyandarua County.
- iv) The purpose is to gauge how ICT infrastructure influences the incorporation of ICT into teaching and learning at public secondary schools in Kinangop Sub-County, Nyandarua County

### **1.5 Research Questions**

The study sought to seek answers to the following questions:

- i) In what manner does teachers' competency impact the adoption of ICT in teaching and learning in public secondary schools in Kinangop Sub-County, Nyandarua County?
- ii) i) In what manner does teacher's attitude impact the integration of ICT into teaching and learning in public secondary schools in Kinangop Sub-County, Nyandarua County?
- iii) i) In what manner does ICT instructional materials affect influencing the integration of ICT into teaching and learning in public secondary schools within Kinangop Sub-County, Nyandarua County?
- iv) To what degree does ICT infrastructure play a part in influencing the integration of ICT into teaching and learning in public secondary schools in Kinangop Sub-County, Nyandarua County?

### **1.6 Significance of the Study**

The information generated by this study may significantly benefit teachers who are integrating ICT in the teaching process as they may learn from the influence of ICT on the teaching and learning processes. Further, it is hoped that the information garnered may help policy makers to devise ways of replicating the successes in other institutions. Moreover, it is anticipated that the research findings may agitate more thoughts for further study in the field of ICT integration in education.

The anticipation is that this research could furnish data and insights into school-based factors and their impact on the incorporation of ICT in teaching and learning within public secondary schools. This knowledge might prove valuable for researchers specializing in educational administration, planning, curriculum development, and secondary school instruction, thereby encouraging subsequent studies in these domains.

The study's results would provide valuable insights for institutions under the Ministry of Education, including the Kenya Institute of Curriculum Development (KICD), teacher training colleges (TTCs), and the inspectorate. This information pertains to the school-based obstacles that hinder the integration of ICT in teaching and learning within public secondary schools. Consequently, these findings might also inspire teacher educators to devise innovative strategies for incorporating ICT into teaching and learning within public secondary schools.

### **1.7 Limitations of the Study**

Administering the questionnaire may have been biased as the responses of the respondents was used for analysis. Their answers might have been subjected to their perceptions and opinions and further may have been viewed by how someone felt about the question at hand (Nelson, 2006). The researcher thus used interview schedule as a mitigation measure to the limitation.

### **1.8 Delimitation of the Study**

Only the public secondary schools within Kinangop Sub-County, Nyandarua County, were considered for this study. Furthermore, the scope of the study was limited to educators, fourth-year (form four) students, principals, and Quality Assurance and Standards Officers (QASO) within Kinangop Sub-County. The primary focus of the study was to examine the attributes of schools and their impact on the incorporation of information, communication, and technology into the teaching and learning processes within public secondary schools located in Kinangop Sub-County, Nyandarua County, Kenya.

### **1.9 Assumptions of the Study**

In the proposed study, the following assumptions was made:

- a) School administrators are familiar with the National and the Ministry of Education Science and Technology ICT policies.

### **1.10 Definition of Significant Terms**

This section presents definition of key terms in this study.

**Attitude of teachers** pertains to the viewpoints and convictions held by teachers regarding the adoption of ICT in educational processes .

**Computer** refers to any electronic, magnetic, optical or other high- speed data processing device.

**ICT instructional materials** refer to the electronic aids that are used in teaching and learning such as computers, audio visual, and digital devices.

**ICT integration** pertains to the utilization of ICT for the purpose of introducing, strengthening, complementing, and expanding skills within the educational processes.

**Information Communication Technology** pertains to the tools such as computers, radio, television, internet, video, and digital cameras that facilitate the gathering, processing, transmission, and provision of information and communication services.

**ICT Infrastructure** refers to the information and communications technology infrastructure and systems (including software, hardware, firmware and networks) that is used in the school.

**Internet** refers to interconnected systems of networks that connect computers.

**School administrators** refer to the heads of school, deputy heads, and heads of department in secondary schools.

**School-based factors** pertains to the tangible, personnel, and monetary assets within the school environment that impact the utilization of ICT in the educational process..



**Teachers' competence** refers to the skills and knowledge that enable a teacher to be successful.

### **1.11 Organization of the Study**

This study is organized in five chapters. The primary chapter investigates the foundation of the ponder, articulation of the issue, reason of the ponder, goals of the consider, inquire about questions, noteworthiness of the think about, restrictions of the ponder, delimitations of the consider, think about suspicions, and definition of the key terms. Chapter two gives the writing survey on The Concept of ICT Integration; Teachers' Competency and Integration of ICT; Demeanor of Teachers' and Integration of ICT; ICT Guidelines Materials and Integration of ICT; and ICT Foundation and Integration of ICT, hypothetical system, and the conceptual system. Chapter three presents inquire about strategy covering inquire about plan, target populace, test estimate and inspecting methods, investigate rebellious, legitimacy and unwavering quality of investigate rebellious, information collection strategies, information examination procedures, and moral contemplations. Chapter four centers on introduction of information investigation, elucidation, and dialog of discoveries. Chapter five covers outline of the ponder, conclusions, and suggestions. Proposals for advance research are moreover displayed within the chapter.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

This chapter covers introduction, the review of literature on influence of school-based factors on integration of information communication and technology in teaching and learning. The sub-topics to cover in this section includes the concept of ICT Integration; teachers' competency and integration of ICT; attitude of teachers' and integration of ICT; ICT instructional materials and integration of ICT; and ICT infrastructure and integration of ICT. It also contains a summary on literature review, theoretical framework, and conceptual framework.

#### **2.2 The Concept of ICT Integration**

As per Williams (2003), the integration of Information and Communication Technology (ICT) deals with procedures of employing any form of ICT (encompassing online information sources, multimedia programs stored on CD-ROMs, learning objects, and other similar tools) to enhance the learning experience of learners. The integration of ICT into teaching and learning (IITL) generates dynamic learning settings, nurturing students' active, self-directed, and constructive interaction with knowledge. Coleman, Gibson, Cotten, Howell-Moroney, and Stringer (2016) contend that the proficient utilization of ICT within the classroom setting results in a shift from a teacher-centered classroom to a learner-centered one. They underscore that this shift in focus, from teaching to learning, cultivates a more engrossing and captivating

learning milieu for both educators and pupils. Consequently, this alters the role of the teacher from being merely a transmitter of knowledge to assuming the roles of a facilitator, a guide in navigating knowledge, and a co-learner.

As per the UNECSO (2019) definition of ICT, it encompasses a wide range of technology instruments used in data making, storage, transmission and transfer of information from one individual to another. The instruments incorporated in ICT include the PCs, online newspapers and books, radios, TVs, sound and video recorders and players, satellites, online conferring apps among another instrument (Prestridge, Tondeur, & Ottenbreit2019). Ngeze & Sridhar (2019) additionally notices that other ICT devices used in teaching and learning include Projectors, scanners, DVDs and PC programming among other equipments. Due to the importance of ICT in today's economy, most education systems endeavor their educational institutions.

The way individuals think, work, and lead their lives today has been completely transformed by the advancements in Information and Communications Technology (ICT), as noted by (Grabe, 2007). Educational institutions, including schools, aiming to prepare students for thriving in a "knowledge society," must consider the integration of ICT into their curricula, as suggested by (Ghavifekr, Afshari & Amla Salleh, 2012). In this context, teachers play a pivotal role in introducing ICT within their classrooms and equipping students for the demands of the modern digital landscape. (Arnseth

& Hatlevik, 2012) emphasized that this is due to ICT's potential to establish dynamic and proactive teaching and learning environments.

Tondeur, Jo, Krug, Mike, Maaik and Chang (2019) successful utilization of benefits both the instructors and the learners. It enables the instructors to embrace students focused instruction thus improving students' proficiency, it increases collaboration among learners and the instructors and lessen the burden of the instructors. It also improves the learners reasoning abilities, imaginations, confidence, creativity and intelligence leading to accomplishment of many tasks. For effective integration of ICT as per the TPACK model, pedagogy, content and technology must be properly integrated. In addition to instruction, ICT can be used in classroom management and transformation (Indembukhani, 2021).

Schools bear the burden of equipping students for both their present and the future living in this information-driven society. The arrangement of students in environments conducive to acquiring skills pertinent to proficiently seeking, arranging, and making use of information from diverse sources holds significant importance. This reliance primarily rests on educators' shoulders (Gilakjani, 2017). To overcome the disparity between individuals with and without technological access, the task encompasses adeptly amalgamating technology, playing a role in bridging the "digital divide" (Puentedura, 2013).

ICT today has become a significant area of education in numerous governments. While in certain institutions, ICT is presented as a distinct

subject, in the majority of schools, it plays a role as a supplementary tool for teaching. Proficient utilization of ICT within the classroom can yield remarkable results, provided educators are adequately prepared. By boosting student motivation, ICT contributes to the enhancement of both teaching and learning. When employed in the classroom, ICT effectively assists in elucidating intricate concepts, facilitating swift comprehension for students. The integration of ICT into educational settings can manifest in diverse ways, encompassing the utilization of computer networks, digital resources, websites, multimedia, and other technological means. The integration of ICT pertains to the incorporation of these tools into instructional methodologies within the classroom (Lloyd, 2005). The application of instructional technology (ICT) extends to technical and vocational classrooms, fostering the assimilation of ICT into teaching practices (Kuskaya & Kocak, 2010; Crittenden, 2009).

### **2.3 Teachers' Competency and Integration of ICT in Teaching and Learning**

Educators' skills encompass their self-confidence, technical expertise, and adeptness in employing ICT proficiently for teaching purposes. The proficiency of teachers in integrating ICT within education stands as an essential necessity. To successfully incorporate technology within the educational setting, the ICT skills of teachers in the modern era demand consistent updates in both knowledge and abilities. Collaboration in ICT is vital to enable teachers and students to

navigate the extensive information needed for accomplishing intricate tasks in the worldwide economy. The significance of knowledge and integration is underscored in the context of teachers and students traversing complex activities within the global economy (Sheila & Zhu, 2021).

This include simulation of geographical environment especially the physical aspects, such as land formations like formation of mountains, plateaus, plains, volcanic eruptions among others. Various aspect of human geography such as settlement, farming, tourism, religion and politics among others can be simulated by use of videos. In addition use of ICT reduces classroom boredom and reduces teacher centered learning among other benefits. Challenges faced in using ICT include, inadequate time for preparation of use of ICT and lack of confidence and knowledge to operate the ICT facilities. Some instructors lack the required confidence to handle the ICT equipments as a result they resort to tradition teaching methods even in topics where integration of ICT could have helped to students to understand the concepts better (Omwoki Kennedy & Obuba, 2017).

An improvement of pedagogy through ICT can serve as a potent instrument for enhancing educational equity, thus becoming a pivotal element of inclusive education as highlighted by UNESCO in 2014. The European Commission's report of 2013 reveals that merely 25% of Grade 8 and 11 students, along with 30% of Grade 4 pupils in Europe,

receive instruction from educators who have undergone essential ICT training. While numerous ICT skills are acquired beyond the conventional teacher training framework, further efforts are required to seamlessly integrate ICT into the curriculum, rendering it obligatory rather than optional. In alignment with national strategic development plans that acknowledge the contribution by ICTs in cultivating teacher capabilities and career growth, the recognition of ICT training for educators has grown. Nevertheless, the decision to enforce its mandatory adoption remains occasionally ambiguous.

While previously considered optional within the national curriculum, these courses in teacher training schedules to date have not been declared mandatory for teaching in Rwanda, as indicated by Rubagiza, Were, and Sutherland (2017). To enhance its ICT in Education Policy, Rwanda is currently reassessing its approach, with UNESCO's support in revising the ICT Essentials for Teachers Curriculum, aligned with the UNESCO ICT Competency Framework for Teachers (ICTCFT), as noted in UNESCO's report from 2014. This study aims to not only examine this influence but also to consider the impact of teacher ICT skill advancement, school-based ICT assistance, students' attitudes toward ICT, and school category on the dynamics of teaching and learning. This stands in contrast to previous studies conducted in Rwanda and Europe concerning ICT integration in

educational practices, which primarily concentrated on ICT Policy rather than its direct effects on teaching and learning.

Musumba (2019) instruction leads to a shift from teacher centered method of instruction to learner centered methods that makes learning more authentic, contextual, personalized and self –directed learning. He was therefore of the view that some teaching methods such as demonstration, class discussion and small group discussion can easily be used by the aid of ICT than when methods such as lecture method are used in teaching. For instance, he was of the view that a video could be demonstrated to students on land forming processes such as volcanicity and folding after which the students could be asked to discuss the process in their groups and make notes. He further observed that the quality of content delivered by use of the facilities depends on teachers' knowledge and competence in use of ICT, they however observed that some teachers' lack of confidence and knowledge in use of ICT as well as inadequate time hinders effective instruction by use of the ICT materials.

A research conducted in Malaysia by Ghavifekr (2015) unveiled that proficiently trained teachers stood out as a pivotal factor impacting the efficacy of technology-based education. In an endeavor to evaluate the extent of ICT proficiency and its utilization within classrooms among technical and vocational educators in Malaysia, Alazam, Abdullah, and Abidin (2012) undertook a study. The survey revealed



that a significant proportion of teachers (70%) regularly employed ICT within their classrooms, and the competence level of teachers in terms of ICT was assessed to be moderate.

The objective of Belay, Khatete and Mugo (2020) was to assess the proficiency of educators in integrating ICT into biology education. The research centered on 27 public secondary schools within the region. Using stratified random sampling, a subset of 12 secondary schools from 12 sub-regions was selected for analysis. The findings indicated that a significant number of biology teachers lacked adequate computer literacy training, even though they had participated in computer training sessions. Consequently, their computer-related skills were inadequate.

#### **2.4 Attitude of Teachers and Integration of ICT in Teaching and Learning**

As per Tan and Mishra (2014), there exists a strong connection between teachers' attitudes and their utilization of technology. The researchers argue that teachers' perceived stance on employing technology in education significantly influences their willingness to incorporate ICT into the teaching and learning experience. If instructors possess positive attitudes towards utilizing ICT, they will find it easier to guide and manage interactive ICT platforms with their students. Andoh (2012) findings affirm that in order to cultivate positive attitudes towards ICT, teachers must possess adequate computer expertise to successfully adopt ICT.

The attitudes of teachers are key factors in students' practice and assimilation of new material. If teachers hold differing viewpoints from the goals of an innovation, their attitudes can hinder the proper adoption of that innovation. Thus, teachers play a pivotal role in implementing the curriculum. The sentiment of educators towards the incorporation of ICT holds immense importance, given that they are responsible for designing the learning environment. According to Kaino (2017), a teacher's perspectives and attitudes significantly shape their utilization of ICT. The adoption and utilization of technology in the classroom, as well as the success of its integration, are heavily impacted by the teacher's beliefs and attitudes (Pierce and Ball, 2009). This underscores the teacher's responsibility in cultivating a positive attitude among students towards ICT.

Hong (2016) conducted a research project to explore the viewpoints of educators regarding the integration of Information and Communication Technology (ICT) in education. The investigation employed open-ended, semi-structured interviews and involved 23 teachers hailing from different regions of Colorado, USA. The outcomes of the study revealed that the participating teachers held a positive outlook on utilizing ICT as a means of instruction. They expressed enthusiasm for incorporating ICT into their teaching techniques and strategies. The educators consistently exhibited their eagerness to infuse ICT into their lessons and expressed a keen interest in innovating new approaches to leverage ICT effectively in delivering educational materials to their students.

A according Musumba ( 2019) formulation students' assessment through ICT has a number of benefits , such as, it minimizes on use of papers, it saves on the examiners time as one copy of exams may be administered to several learners online, it also enable the examiner to give a standard time for the examined. The challenges of use of ICT in students' assessment are that it requires knowledge and skills to operate the various applications used in administering online examination, it requires ICT equipments which may be costly to students, and it also need additional cost of internet and power supply which at times may be limited during examinations leading to disruption of exams.

Langat, (2020) is in agreement with Musumba (2019) on the view that teachers' ability to formulate students assessment by use of ICT largely depends with teachers knowledge and skills to operate the ICT equipments. In addition Langat observes that for effective use of ICT there may be need of adequate supply of electricity, internet connection, and adequate photocopying papers for printing and adequate ICT gadgets such as students' laptops for students' online examinations.

Mwanda (2017) established that the attitudes that teachers have towards integration of ICT ranges from avoidance, dislike, hatred, anxiety, enthusiasm and confidence in relation to the usefulness of the computers in personal and social life, a view that is also held by Semerci, Ali & Kemal (2018).

Daher, Baya'a, and Anabousy carried out an experimental investigation centered on in-service Mathematics educators and their adoption of ICT as an innovative approach within lower secondary education. The study unveiled that these teachers held favorable attitudes and convictions toward this integration. However, despite their optimistic sentiments, they exhibited a hesitancy to incorporate technology into their instructional routines. This hesitancy stemmed from their limited familiarity with technology and the challenges they faced while attempting to seamlessly integrate ICT into the educational context.

Conducting their research within a technologically advanced classroom in Pretoria, South Africa, Adegbenro, Gumbo, and Olakanmi (2017) examined the requirements for integrating technology among secondary school teachers already in service. The findings of the study revealed a prevailing inclination among educators towards incorporating computers within the classroom environment. There existed a willingness among teachers to further acquaint themselves with the implementation of computers in teaching and learning. Nevertheless, a significant obstacle arose due to the deficiency in both expertise and pedagogical skills necessary for the proficient use of ICT. Consequently, instructors faced difficulties when attempting to seamlessly integrate this technology into their day-to-day instructional routines.

The findings of the study conducted by Wambiri and Ndani (2016) indicated that primary school teachers in Kenya held favorable opinions

regarding the incorporation of diverse technologies in education. This suggests that with appropriate support, the integration of Information and Communication Technologies (ICT) in school settings has the potential for success. The study's conclusion emphasized that teachers were not only confident in the advantages of utilizing ICT for instructional purposes but also believed in its positive impact on their students. This aligns with the idea that teachers' perceptions of technology's significance for their students play a pivotal role in nurturing their creativity and originality (KICD, 2017; Waweru, 2018).

## **2.5 ICT Instructional Materials and Integration of ICT in Teaching and Learning**

If we consider the interconnection of Internet, multimedia, and related technologies with literacy learning in a broader context involving accessing information, communication, and knowledge application, it becomes more probable that the incorporation of ICTs into educational processes will occur (Zhu, 2015). Put differently, ICTs enhance, expand, and revolutionize the role of language throughout the learning journey, serving as fundamental elements for acquiring general skills, competencies, applied knowledge, as well as basic skills or content conveyance. This is particularly relevant as these technologies introduce novel tools, mediums, and functions for learning in the digital era.

Al-Hariri and Al-Hattami (2017) assert that the Internet plays a pivotal role in facilitating the integration of technology within educational institutions.

Scholars highlight that both the Internet and smartphone applications are ushering in an elevated degree of adaptability and flexibility to educational processes. This enhanced adaptability is achievable due to the inherent user-friendly nature of these technologies, allowing for seamless updates to content, personalized instructions, unfettered access to information, efficient information dissemination, and standardized content delivery.

Sung, Chang, and Liu (2016) conducted a study in 2016 to investigate how the utilization of mobile technology in educational settings influences students' academic achievements. Their findings demonstrated that mobile communication devices exhibit significantly superior outcomes compared to traditional instructional methods. Particularly, the effectiveness of mobile devices surpassed that of laptops. The forthcoming research will narrow its focus on educational tools such as computers.

In the research conducted by Toochukwue (2019), the exploration centered on the integration of ICT tools into agricultural education curricula, with the aim of enhancing the delivery of high-quality instruction. The study encompassed an examination of ICT tools suitable for inclusion in agricultural education curricula, the manner in which these tools can enhance instructional quality, the benefits arising from the integration of ICT in agricultural education curricula, the obstacles associated with this integration, and approaches for enhancing the seamless incorporation of ICT within the agricultural education curriculum.

Examining the subject, Murithi and Yoo (2021) delved into the accessibility of ICT resources, educators' capacity to integrate technology into their instructional approaches, and teachers' attitudes towards technology within educational settings. Their investigation was primarily founded upon the Technology Acceptance Model and the principles of constructivist learning. The research was conducted via an online survey, which garnered responses from a total of 351 instructors. Forming the determination was the fact that the teaching staff viewed the availability of ICT resources in schools to be inadequate, thereby posing challenges for the seamless adoption of newer technologies into the implementation of the new curriculum. A significant proportion of teachers expressed having received only minimal training in computer literacy. Despite recognizing the potential benefits of utilizing computers in classrooms, teachers encountered difficulties in effectively assimilating technology into their teaching methodologies.

## **2.6 ICT Infrastructure and Integration of ICT in Teaching and Learning**

Adequate infrastructural resources and facilities are necessary to ensure the successful adoption of ICT policies in education. Liang et al. (2015) conducted a study over six years on the digital classroom environment and found that several fundamental amenities are crucial for the integration of ICT. They argue that for technology to be utilized effectively in the classroom, there needs to be provision for teacher and student devices, shared display projectors, network access, and other supporting equipment. Mingaine (2016) corroborates this assertion by highlighting the indispensability of electricity,

computer hardware, software, and connectivity to achieve successful ICT integration.

Moluayonge and Innwoo (2017) carried out a study regarding the utilization of information and communications technology by teachers in secondary schools within Cameroon. The study utilized responses from 320 teachers who participated in a survey to collect relevant data. The outcomes of the investigation revealed that the inadequate information and communications technology infrastructure in secondary schools across Cameroon played a role in the limited integration of ICT tools in the learning process. The survey determinations also unveiled that educators faced challenges such as a lack of proficiency and self-assurance in using ICT, restricted availability of resources, and inadequate support in implementing technological tools in classroom instruction.

In Makueni County Secondary Schools in Kenya, Ndolo (2020) conducted an investigation into the impact of incorporating information and communication technologies in the biology classroom on the academic performance of students. The research also uncovered that, even though certain ICT tools for biology teaching were available, most teachers rarely utilized them or actively encouraged their students to use ICT for biology. The study concluded that the primary obstacles to integrating ICT into biology teaching included: inadequate or insufficient access to ICT resources, unreliable electricity supply, limited space or the absence of laboratories within the institution, lack of proficiency or awareness in ICT usage,



economic challenges in procuring ICT materials, insufficient time for ICT utilization, and reduced ICT infrastructure.

In Isinya Sub-county, Kenya, a study was carried out by Ogachi (2015) to investigate the factors influencing the utilization of information and communication technology (ICT) by principals in the management of public secondary schools. The research employed a descriptive survey design. The study encompassed all twelve public secondary schools within Isinya Sub-County as its target population. From this population, ten schools were randomly selected to partake in this survey, and another two schools being set aside for a pilot investigation. Within the selected ten institutions, ten principals, ten deputy principals, and ten senior teachers were included in the study's sample. The research findings indicated a correlation between the ICT literacy of principals and their integration of ICT tools into various administrative functions. Notably, those institutional heads who had incorporated ICT in their managerial duties were discovered to have engaged in ICT training programs, providing substantiation for this trend. Nonetheless, the investigation showed that the utilization of ICT amongst principals was primarily centered around financial management and showed comparatively less emphasis on enhancing interactions within the school community.

In the Githunguri Sub-county located in Kiambu County, Kenya, an analysis undertaken by Mbatia (2014) to examine the components impacting the incorporation of ICT by school principals in the running of public secondary schools. The research employed a descriptive survey methodology

and encompassed a target population of 123 department heads, 32 deputy principals, and 32 principals. Conducted across 10 public secondary schools, the study involved a random selection of 40 department heads, 10 principals, and 10 deputy principals to participate.

According to the findings of the study, a significant proportion of principals lack proficiency in computer skills, including Microsoft Word (60%), PowerPoint (60%), email and internet usage (60%), and Microsoft Excel (70%). This lack of proficiency hinders their effective integration of ICT into school administration. It is particularly disheartening to observe that, concerning PowerPoint, email, and internet usage, 30%, 20%, and 20% of the principals, respectively, lacked technological proficiency. Based on informal interviews with these principals, it was evident that they relied on school secretaries to access the internet on their behalf.

## **2.7 Summary of the Literature Review**

The literature under review has examined research on school-based elements and the integration of ICT. In their work, Belay, Khatete, and Mugo (2020) assert that teachers' literacy has a significant contribution in influencing ICT incorporation. Meanwhile, the findings of Adegbenro, Gumbo, and Olakanmi (2017) indicated that teachers held favorable attitudes towards incorporating computers into their classrooms. However, the current study aims to determine the degree to which ICT skepticism, innovation in ICT skills, and professional experience impact the integration of ICT.

Musumba (2019) and Langat (2020) both concur with one another in their view that teachers' ICT literacy is a prerequisite in formulation of students' assessments and examinations through use of ICT, however, the additional requirements for effective integration of ICT such as stable internet connection and students access to enough laptops for online examinations has always been sidelined by most researchers. In addition the literature reviewed have failed to identify the frequency of students' assessment in geography which help in improvement of students' mastery of content. Frequency of students' assessment can be aided by the teachers' literacy on ICT which help in formulation of the assessments. This research will therefore establish on schools internet connection and adequacy of ICT equipments for students use especially on examinations that require use of computers.

In a study conducted by Sung, Chang, and Liu (2016), the impact of incorporating mobile technological devices into education was investigated with regard to its effect on students' academic performance. The results of the research indicated that utilizing mobile communication devices for learning yielded notably superior outcomes compared to traditional instructional approaches. Correspondingly, Mooketsi (2021) and Moluayonge and Innwoo (2017) discovered that only a limited number of factors exerted positive effects on the integration of information and communication technology (ICT). In a separate study, Ndolo (2020) analyzed the consequences of integrating ICT in teaching biology on students' achievements within

secondary schools in Makueni County, Kenya. Moluayonge and Innwoo (2017) identified that challenges such as inadequate teacher competence and confidence, restricted access to available resources, and insufficient ICT support hindered the effective use of ICT in teaching. However, it's important to note that the findings of these studies may not be universally applicable to Nyanarua Sub County. Consequently, the current research aimed to ascertain the impact of ICT training and the incorporation of ICT in lesson planning and delivery on the integration of ICT within this specific context.

## **2.8 Theoretical Framework**

This research adopted Roger's theory of Diffusion of Innovation (2003). This principle explains why, the manner and the rate new ideas or innovation undergoes adoption by members of a given culture. The theory is made up of four main components; namely i) innovation; that deals with an idea, a practice or project that is presented as new or other adoption unit. ii) Communication channel; which refers to the process by which an individual creates and share an information with another individual to reach a mutual understanding., iii) Time; which refers to the duration that one takes to adopt a new idea, iv) Social system which is a collection of interconnected entities collaborating in solving a shared problem with the aim of achieving a mutual objective.

Based on Rodgers' there are five stages involved in the adoption and implementation of a new idea, these include, the knowledge stage where an individual inquiries about what the idea is all about, how it work and why it

should be adopted, the persuasion stage where one forms either a favorable or unfavorable attitude towards a new idea, the decision stage where one either adopt or reject a decision, the implementation stage where one puts the new idea into practice and the confirmation stage where one find reasons to continue using the idea.

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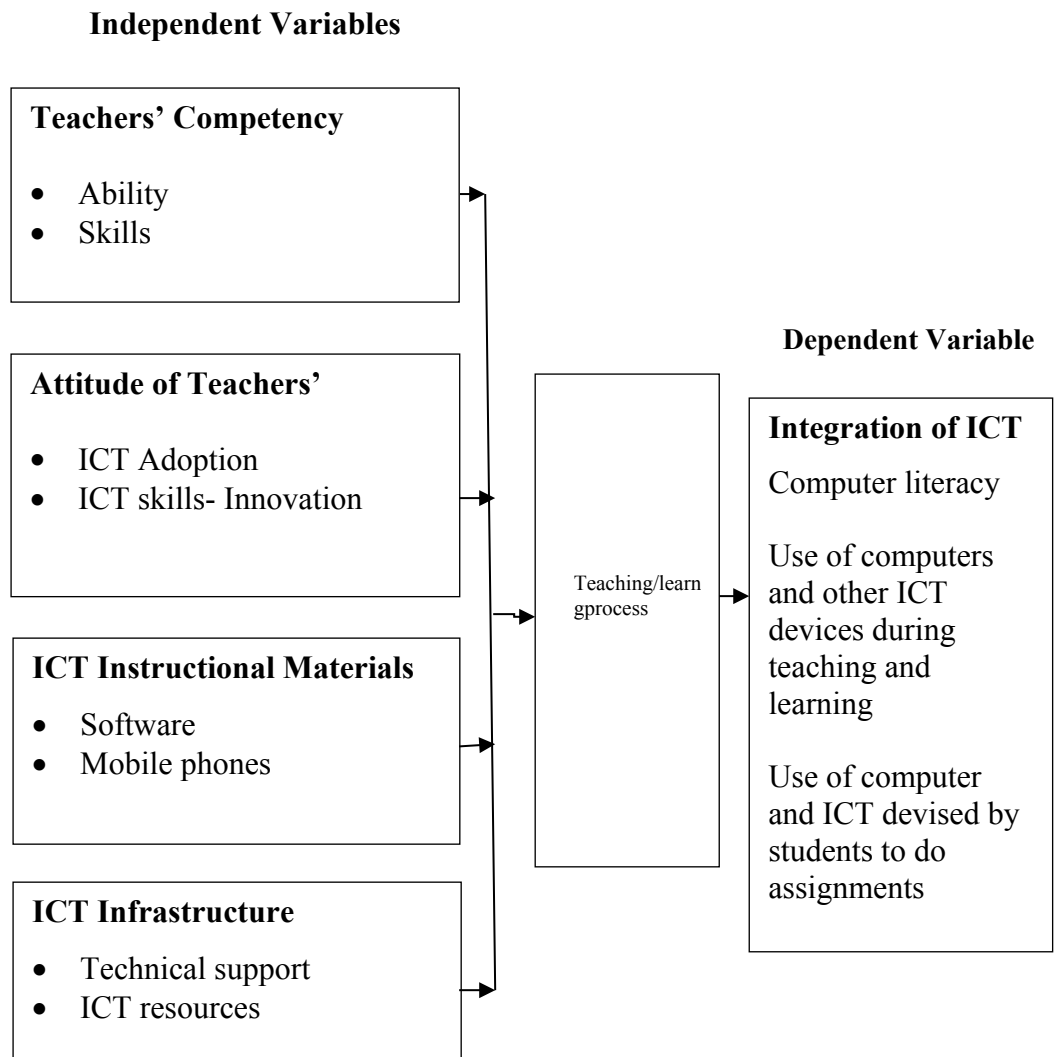
Adoption of innovation as per Rodgers is influenced by five main factors which are relative advantage, compatibility, complexity, triability, and observability. Rodgers is also of the idea that there are various categories of adopters ranging from innovators who are the first people willing to try a new idea, early adopters, early majority, late majority, and laggards who are the last people to adopt an idea having realized how the idea has benefited other people.

This theory fits this research since integration of ICT in education may be treated as a new idea in most educational institutions of developing countries, the rate at which a teacher may decide to adopt the utilization of ICT in education may depend with the teacher's individual characteristics such as the teacher's attitude, which may lead to their groupings in the categories of adopters. In addition, the teacher's attitude and level of ICT literacy will influence the teachers' view of the relative advantage, compatibility, and complexity of use of ICT in instruction which will then influence their decision on whether to incorporate ICT in teaching and learning.

In essence, the theory of diffusion of innovations could be highly beneficial for examining technological advancements within educational institutions. As such, Rogers' theory of diffusion of innovations proved to be particularly valuable in comprehending the following aspects: (1) the introduction of technological novelties in instructional programs; (2) the process of adopting innovations by teachers along with its associated stages; (3) the technological requirements of distinct adopter groups, including early and late adopters; (4) the communication channels employed by individuals to exchange technology-related information; and (5) the organizational components of the social system and their impact on the adoption of technology. Consequently, the research concluded that Rogers' (2003) diffusion of innovations theory was instrumental in addressing the study's research inquiries.

## **2.9 Conceptual Framework**

The arrangement depicted in Figure 2.1 illustrates the interconnection between independent and dependent variables. According to Mugenda and Mugenda (2003), a conceptual framework is described as a graphical or narrative representation of the fundamental concepts or variables, along with their assumed interconnections.



**Figure 2. 1: The Relationship between Variables on School Based Factors and Integration of ICT.**

Figure 2.1 show that ICT integration requires teachers' competency, attitude of teachers', ICT instructional materials and ICT infrastructure. The four variables are integrated in the teaching- learning process and the result will ICT integration. The indicators of ICT integration will be increased by computer literacy, use of computers in during teaching and learning.

### CHAPTER THREE



## **RESEARCH METHODOLOGY**

### **3.1 Introduction**

This chapter introduces the research methodology employed for the study. It encompasses the research design, the intended population, sample size, and sampling methods. Within this section, there's a comprehensive discussion about the research tools, along with an exploration of the validity and reliability of these instruments. The procedures for gathering data are outlined, followed by an overview of the techniques used for data analysis. Ethical concerns related to the research are also addressed in this segment..

### **3.2 Research Design**

The study's orientation revolved around a descriptive survey design. To comprehend the present condition of a population concerning one or more variables of interest, employing a descriptive survey design becomes imperative (Kothari & Garg, 2014). The suitability of the descriptive survey method for this study stems from its capacity to acquire precise data about the current state of the phenomenon and conduct an unbiased analysis (Jwan, 2010). Opting for a descriptive survey research strategy, the researcher facilitated the derivation of dependable generalizations from the amassed data. This arrangement facilitated the depiction of how information, communication, and technology were fused into the teaching and learning processes within public secondary schools in Kinangop Sub-County, Nyandarua County, Kenya.

### **3.3 Target Population**

The target population refers to a collection that the researcher emphasizes, and the determinations derived from testing the sample ought to be applied to this group (Orodho, 2009). For this study, the target population consisted of 30 principals, 365 teachers, 1 Sub County Director of Education, 1 Sub County Quality Assurance Officer, and 3,078 Form Four students (according to the Education Office Report, 2019, for Kinangop South Sub County).

### 3.4. Sample Size and Sampling Procedures

Sampling involves selecting and analyzing a relatively small number of individuals, objects, or events to gain insights about the entire population (Kothari & Garg, 2014). Best and Kahn (2012) define sampling as a statistical technique for determining an appropriate sample size, enabling the researcher to extrapolate the results to the population.

**Table 3. 1: Sampling Frame**

<b>Study population</b>	<b>Target population</b>	<b>Sampling method</b>	<b>Sample size</b>	<b>Data collection instruments</b>
<b>Principals</b>	30	Census	30	Questionnaire
<b>Teachers</b>	365	Stratified sampling	109	Questionnaire
<b>Students</b>	3078	Stratified sampling	308	Questionnaire
<b>SCDE</b>	1	Purposive sampling	1	Interview Guide
<b>SCQASO</b>	1	Purposive sampling	1	Interview Guide

From each stratum the study selected the sample using purposeful technique to arrive at the sample shown in table In purposive sampling the researcher relies on his own experience to select a desirable sample. Purposive sampling method may prove to be effective when only limited number of people can serve as primary data sources (Mugenda & Mugenda, 2003). The researcher purposively sampled principals, SCDE and SCQASO officials, while 30% of teachers and 10% of students were selected.

### **3.5 Research Instruments**

The data collection methods employed in this research involved surveys and an interview guide. According to Yin (2018), questionnaires possess the capacity to accumulate substantial data within a feasible timeframe, enabling measurement in favor of or against a specific viewpoint. The questionnaires deployed in this investigation were tailored to extract responses related to each distinct independent variable.

The survey administered to principals, teachers, and students consisted of two sections. Section A was dedicated to collecting demographic information, while Section B was designed to gather data aligned with each research objective.

A structured interview guide was employed to elicit comprehensive insights from SCDE and SCQASO, who were identified as crucial information sources. By skillfully probing and prompting the participants, the interview schedule aided in ensuring that a substantial portion of relevant information

was obtained. As outlined by Creswell (2012), an interview schedule assists researchers in collecting in-depth details by persistently engaging with respondents. Moreover, the interview schedule granted the researcher greater flexibility to refine question wording, thereby eliminating potential ambiguities.

### **3.5.1 Instrument Validity**

Validity refers to the extent to which research accurately assesses its intended measurements or reflects the accuracy of its findings (Kothari & Garg, 2014). Content validity ascertains whether the research instruments effectively gauge the intended content. To establish validity, several steps were taken. Firstly, input from supervisors was sought to incorporate their suggestions into the new research instruments. This involved the researcher's consultation with supervisors to assess and include their recommendations. Secondly, validity was reinforced through the utilization of multiple research instruments, employing the triangulation method. Lastly, interviews were conducted, and supervisor consent was obtained to validate the process.

### **3.5.2 Instrument Reliability**

As per the findings of Best and Kahn (2010), this is the precision and consistency of outcomes when applied to a similar population on multiple occasions. Reliability can be defined as a gauge of how effectively a given research instrument yields consistent outcomes through repetitive experiments. It gauges the extent to which a specific measuring approach yields consistent outcomes across numerous repeated trials, as indicated by Orodho (2012). To

guarantee the dependability of the instruments, one method employed was their preliminary assessment.

Hence, the study carried out a preliminary investigation using the instruments before data collection commenced. This procedure ensured the appropriate enhancement of certain utilized elements. The approach encompassed a test-retest method, involving the administration of the same instrument two times to the identical group of participants within the three chosen schools (constituting 10% of the intended schools). The results obtained during the preliminary assessment were assessed using Cronbach's Alpha coefficient.

**Table 3.2: Reliability Analysis Results**

<b>Determinant</b>	<b>No of items</b>	<b>Cronbach's</b>	<b>Verdict</b>
<b>Teachers' Competency</b>	6	.824	Reliable
<b>Attitude of teachers</b>	6	.733	Reliable
<b>ICT Instructional Materials</b>	7	.821	Reliable
<b>ICT Infrastructure</b>	7	.752	Reliable
<b>Integration of ICT</b>	8	.911	Reliable

The comprehensive Cronbach's Alpha scores demonstrate that the data collection instrument exhibited reliability, as the values surpassed the desirable threshold of 0.7 and beyond.

### **3.6 Data Collection Procedures**

Once approval was obtained from the university's Department of Educational Management, Policy, and Curriculum Studies, an application for a research permit was submitted to the National Commission for Science, Technology, and Innovations (NACOSTI). Prior to collecting data, approval was sought from both the County Commissioner and the Sub-County Education Officer, allowing for permission to be granted for the research to proceed in the respective schools. Correspondence was sent to the selected schools, arranging and confirming the details for the upcoming data collection process. The researcher established a positive relationship with the chosen participants to ensure a clear understanding of the study's objectives. The distribution of questionnaires followed a "drop and pick later" approach, while key informants were interviewed using an interview guide administered by the researcher..

### **3.7 Data Analysis Techniques**

As outlined by Matula et al. (2018), the process of data analysis encompasses various steps. Initially, the raw data is deconstructed into comprehensible segments, followed by amalgamating these segments to identify emerging patterns. Ultimately, conclusions are drawn from the synthesized data. To ensure thoroughness, the collected data underwent meticulous examination.

Subsequently, the responses to the inquiries were categorized into distinct groups. These categorized groups were then inputted into the

Statistical Package for Social Sciences (SPSS) software version 23.0 for analysis. The quantitative data, presented in frequency distribution tables, pie charts, and bar graphs, underwent scrutiny using descriptive statistical techniques, including frequency distribution and percentage calculations.

Qualitative information obtained from interviews was documented in field notes. These notes underwent an editing process to eliminate any ambiguities and were subsequently summarized. The data was categorized into specific themes and patterns, followed by the creation and application of conceptual codes.

Subsequently, the coded categories underwent analysis using SPSS. The outcomes of this analysis were then transformed into narrative summaries and overarching conclusions. The quantitative aspect of the study involved utilizing descriptive and inferential statistical methods, encompassing correlation tests, analysis of variance, and regression analysis. Concurrently, a thematic analysis was conducted on the qualitative data

### **3.8 Ethical Considerations**

Ethics concentrates on the principles embraced by participants, necessitating ethical standards throughout the phases of study planning, data gathering, analysis, sharing of findings, and results utilization. In the work of Henn, Weinstein, and Foard (2009), it was noted that ethics in social research encompass matters related to the conduct of social researchers and the

repercussions that their investigations have on the subjects of their studies. The researcher acquired informed consent from the participants, ensuring their voluntary and confidential involvement throughout. Personal accountability was assumed by the researcher in conducting the study, maintaining transparency and candor while engaging with the participants. Both the physical and psychological well-being of the participants were safeguarded by the researcher. Ultimately, the researcher provided a comprehensive pre-research explanation and post-research "debriefing" to the participants. The researcher guaranteed the participants that the collected data would be solely employed for academic purposes.



## **CHAPTER FOUR**

### **DATA ANALYSIS, PRESENTATION AND DISCUSSION**

#### **4.1 Introduction**

In this chapter, the research findings of the study are presented. The study investigated how school-based factors influence the integration of information communication and technology (ICT) in teaching and learning within public secondary schools in Kinangop Sub-County, Nyandarua County, Kenya. The research objectives were guided by the following variables:

To determine the impact of teachers' competency on the integration of ICT in teaching and learning in public secondary schools.

To examine the attitudes of teachers towards integrating ICT in teaching and learning in public secondary schools.

To identify the various ways in which ICT instructional materials affect the integration of ICT in teaching and learning in public secondary schools.

To investigate the role of ICT infrastructure in the integration of ICT in teaching and learning in public secondary schools.

The analysis of data was conducted using SPSS Computer Software version 23.0 due to its success in handling large volumes of content. This chapter presents details about the response rate, demographic information of the principals, teachers, and form four students. Additionally, it covers data

analysis, presentation, and discussion in alignment with the research objectives.

#### 4.2 Questionnaire Return Rate

Table 4.1 displays the rate of questionnaire returns for the study.

**Table 4. 1: Questionnaire Return Rate**

<b>Participant</b>	<b>Number Issued</b>	<b>Number Returned</b>	<b>Percentage Returned</b>
<b>Principals</b>	30	30	100%
<b>Teachers</b>	109	105	96.33%
<b>Form four students</b>	308	130	77.92%

The response rate for principals and teachers was 97.1%. Kothari & Garg (2014) consider a response rate of over 50% to be sufficient for a descriptive study. The high return rate of questionnaires from principals and teachers can be attributed to the researcher's personal visits to schools, allowing for in-person administration of the questionnaires and immediate collection.

#### 4.3 Demographic Information

This area introduces distinct characteristics of every participant, encompassing age, gender, highest educational achievement, and duration of employment. The outcomes of the demographic analysis were employed to

evaluate the appropriateness of the respondents' involvement in the research and their interaction with the variables being investigated. Questionnaires were utilized to gather demographic information from principals, teachers, and form four students.

### 4.3.1 Gender Distribution of Respondents

Within this research, it became imperative to assess the gender distribution among teachers. This was undertaken to ascertain the involvement of both males and females in integrating information and communication technology into secondary school teaching. The outcomes of this analysis are outlined in Table 4.2.

**Table 4. 2:Gender Distribution**

<b>Gender</b>	<b>Principals</b>		<b>Teaching staff</b>		<b>Students</b>	
	<b>F</b>	<b>%</b>	<b>F</b>	<b>%</b>	<b>F</b>	<b>%</b>
Male	21	70%	68	65%	96	40%
Female	9	30%	37	35%	144	60%

Table 4.2 illustrates that most of the principals were male, whereas a minority were female. Consequently, females did not participate in the integration of information and communication technology into secondary school teaching. These findings align with Michael's (2019) observations, highlighting the male dominance in secondary schools. When considering student representation by gender, it becomes evident that the number of female students surpasses that of male students.

### **4.3.2 Age Distribution of Principals, Teachers and Students**

The investigation here aimed to analyze the age distribution among principals, teachers, and students to identify the age groups involved in the integration of information communication technology into secondary school teaching. The results of this investigation are outlined in Table 4.3.

**Table 4. 3:Distribution of Respondents' Age**

Age in years	Principals		Teachers		Students	
	F	%	F	%	F	%
15-18	-	-	-	65%	168	70
19 -21	-	-	-	35%	48	20
22 and above	-	-	-		24	10
Below 30 years						
30-40	5	17	53	50%	-	-
40-50	13	43	40	39%	-	-
50-60	12	40	12	11%	-	-
<b>Total</b>	<b>30</b>	<b>100</b>	<b>105</b>	<b>100</b>	<b>240</b>	<b>100</b>

Data from Table 4.3 gives an indication that majority of principals and teaching staff were of ages bellow 30 years which accounted to 50%. Most teachers in Kinangop Sub-County, Nyandarua County are therefore in their mid- thirties.

#### **4.3.3 Respondents' Academic Qualifications**

Here the investigation intended to assess the educational attainment of both principals and teachers. The outcome is displayed in Table 4.4. The level of principals and teachers' educational qualification was considered as an important contributor to integration of information communication technology in education.

The result of the teachers' level of education is captured in Table 4.4.

**Table 4. 4:Distribution of Teachers Academic Qualifications**

<b>Academic Qualifications</b>	<b>Principals</b>		<b>Teachers</b>	
	f	%	f	%
Degree	20	67	59	56
Masters	8	27	45	43
Phd	2	6	1	1

Table 4.4 indicates that a huge number of teachers 80.7% had bachelor’s degree, 43% had masters degree. The result shows that a higher percentage of teachers had acquired Bachelors’ degree. This shows that most teachers in Kinangop Sub-County, Nyandarua County have acquired relevant knowledge and pedagogies required to implement the integration of ICT.

### **3.4 Teaching Experience**

The investigation additionally sought to find out teachers’ years of teaching experience in integration of information communication technology in teaching in secondary schools. The findings are captured in Table 4.5.

**Table 4. 5:Teaching Experience**

<b>Years</b>	<b>Principals</b>		<b>Teachers</b>	
	F	%	F	%
Less than 5	3	10%	11	10%
6-10 years	6	20%	30	29%
11-15years	11	37%	53	51%
16-20years	8	27%	11	10%
Over 21yrs	2	6%	-	-

Basing on the study results, most of the principals employed this approach. Specifically, 37 percent of the principals had been part of the teaching profession for a span of 11-15 years. This suggests that they had been involved in incorporating information and communication technology into teaching practices in Kinangop Sub-County, Nyandarua County. Furthermore, a significant portion of the teachers reported having more than a decade of teaching experience. As a result, they were well-acquainted with the integration of information and communication technology for educational purposes in the public secondary schools of Kinangop Sub-County, Nyandarua County, Kenya.

#### **4.4 Teachers' Competency on Integration of ICT in Teaching and Learning**

The first objective of the study sought to determine influence of teachers' competency on integration of ICT in teaching and learning in public secondary schools in Kinangop Sub-County, Nyandarua County. Teachers' competency indicators included ability and skills. During the analysis, the mean and standard deviation were employed to demonstrate both central tendency and dispersion measures. The responses provided by principals and teachers have been outlined in Table 4.6.

**Table 4. 6:Principals Response on Teachers’ Competency on Integration of ICT in Teaching and Learning**

Statements	S		A		UN		D		SD		Mean	Stdv
	F	%	F	%	F	%	F	%	F	%		
Teaching staff give reference to the internet as source of information	19	62	6	19	3	10	3	10	-	-	4.33	1.01
Teachers always use ICT in each lesson	30	100	-	-	-	-	-	-	-	-	5.00	.00
The computer supports effective teaching as it creates technical problems	21	71	3	10	3	10	3	10	-	-	4.42	1.02
The computer enables the teaching staff successfully	16	53	3	10	-	-	6	20	3	10	3.66	1.59
I’m able to identify the best software to utilize in teaching	6	19	3	10	-	-	19	62	3	10	2.66	1.35
I’m able to teach the students identify suitable software for application in their projects	11	38	7	24	-	-	6	19	6	19	3.42	1.63

**(n=30, Average Mean=3.91)**



Table 4.6 gives an indication that 30(1000%) of the principals disagreed that teachers always use ICT in each lesson (M=5.00, SD=0.00).. Further 83(62%) of the principals indicate that the teaching provide reference to the internet as an informational source. This may be inferred that teachers have integrated information communication technology in teaching (M=4.33, SD=1.01). also , 23(81%) of the principals gave the affirmation that computers offer conduciveness to successful teaching as it brings up technical concerns (M=4.42, SD=1.02). In an analysis by Belay, Khatete, and Mugo (2020), it was discovered that most Biology teachers lacked proper training in computer literacy. Despite having participated in computer training sessions, they still possessed insufficient computer skills.

#### 4.4.1 Principals' Response Correlation Analysis

The aim here was to determine the correlation amongst teachers' proficiency in integrating ICT into teaching and learning, using the Pearson correlation. The results of this analysis can be found in Table 4.7.

**Table 4.7: Correlation Analysis Teachers' Competency and Integration of ICT in Teaching and Learning**

		<b>Competency</b>	<b>Integration</b>
<b>Competency</b>	Pearson Correlation	1.000	.981
	Sig. (2-tailed)		.000
	N	30	30
<b>Integration</b>	Pearson Correlation	.981	1
	Sig. (2-tailed)	.000	
	N	30	30

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

---

The correlation coefficient, denoted as  $r(30) = 0.981$ , with a significance level of  $p(0.000) < 0.5$ , points to a positive association amongst teachers' competence and the integration of ICT in teaching and learning. This finding underscores the significance of teachers' proficiency in successfully incorporating ICT into educational practices.

Musumba (2019) instruction leads to a shift from teacher centered method of instruction to learner centered methods that makes learning more authentic, contextual, personalized and self –directed learning. He was therefore of the view that some teaching methods such as demonstration, class discussion and small group discussion can easily be used by the aid of ICT than when methods such as lecture method are used in teaching. For instance, he was of the view that a video could be demonstrated to students on land forming processes such as volcanicity and folding after which the students could be asked to discuss the process in their groups and make notes. He further observed that the quality of content delivered by use of the facilities depends on teachers' knowledge and competence in use of ICT, they however observed that some teachers' lack of confidence and knowledge in use of ICT as well as inadequate time hinders effective instruction by use of the ICT materials.

#### **4.3.2 Principals' Response Regression Analysis**

A Simple Linear Regression analysis was conducted to assess the predictive capability of teachers' competence in relation to the adoption of ICT in educational processes, as illustrated in Table 4.8

**Table 4.8: Model Summary**

<b>.Model</b>	<b>R</b>	<b>R Square</b>	<b>Adjusted R Square</b>	<b>Std. Error of the Estimate</b>
1	.981 <sup>a</sup>	.962	.960	.22062

a. Predictors: (Constant), Teachers' competency

Table 4.8 displays an R Square = 0.962, indicating that teachers' competence accounts for 96.2% of the variance in the integration of ICT in teaching and learning. Additional analysis revealed an ANOVA p-value of 0.00, which is greater than 0.05. This implies the regression model is suitable for making predictions.

This include simulation of geographical environment especially the physical aspects, such as land formations like formation of mountains, plateaus, plains, volcanic eruptions among others. Various aspect of human geography such as settlement, farming, tourism, religion and politics among others can be simulated by use of videos. In addition use of ICT reduces classroom boredom and reduces teacher centered learning among other benefits. Challenges faced in using ICT include, inadequate time for preparation of use of ICT and lack of confidence and knowledge to operate the ICT facilities. Some instructors lack the required confidence to handle the ICT

equipments as a result they resort to tradition teaching methods even in topics where integration of ICT could have helped to students to understand the concepts better. (Omwoki Kennedy & Obuba, 2017).

**Table 4. 9: Relationship between Teachers'Competency and Integration of ICT in Teaching and Learning**

ANOVA<sup>a</sup>

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	23.482	1	23.482	482.424	.000 <sup>b</sup>
	Residual	.925	28	.049		
	Total	24.407	29			

**a. Dependent Variable: Integration of ICT in Teaching and Learning**

**b. Predictor: Teachers'Competency**

The p-value being less than 0.01 signifies the significance of the regression relationship in predicting the impact of teachers' competency on the adoption of ICT in education.

Additionally, the investigator aimed to determine the levels to which the introduction of teachers' competency affects the integration of ICT in teaching and learning. The corresponding findings are presented in Table 4.10.

**Table 4. 10: Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients		Sig.
		B	Std. Error	Beta	T	
1	(Constant)	-.808	.212		-3.806	.001
	Teachers' competency	.895	.053	-.115	21.964	.000

**a. Dependent Variable: Integration of ICT in Teaching and Learning**

The findings in Table 4.10 reveal that when maintaining teachers' competency at zero, the level of integration of ICT in teaching and learning was noted as - 0.808. Consequently, a one-unit rise in teachers' competency would result in a corresponding increase in the integration of ICT in teaching and learning by 0.895 units.

Musumba (2019) and Langat (2020) both concur with one another in their view that teachers' ICT literacy is a prerequisite in formulation of students' assessments and examinations through use of ICT, however, the additional requirements for effective integration of ICT such as stable internet connection and students access to enough laptops for online examinations has always been sidelined by most researchers. In addition the literature reviewed have failed to identify the frequency of students' assessment in geography which help in improvement of students' mastery of content. Frequency of students' assessment can be aided by the teachers' literacy on ICT which help in formulation of the assessments. This research will therefore establish on schools internet connection and adequacy of ICT equipments for students use especially on examinations that require use of computers.

**Table 4. 11: Teachers' Competency on Integration of ICT in Teaching and Learning**

Statements	S		A		UN		D		SD		Mean	Stdv
	F	%	F	%	F	%	F	%	F	%		
Teachers provide the internet as a	14	10	28	20	26	19	24	40	13	10	2.82	1.17

reference informational source													
Teachers consistently utilize ICT in their teaching	69	51	27	20	13	10	13	10	13	10	2.06	1.36	
The computer supports effective learning as develops technical problems	-	-	39	29	26	19	42	31	28	21	2.56	1.12	
Through the computer, teachers are able to teach more effectively	-	-	83	62	26	19	26	19	-	-	3.42	0.79	
I'm able to identify the best software to apply in my teaching	-	-	13	10	26	19	56	42	40	30	2.08	0.93	
I'm able to teach the students to identify suitable software to utilize in their projects	-	-	56	42	27	20	13	10	39	29	2.74	1.26	

**(n=105, Average Mean=2.61)**

Table 4.11 gives an indication that 67(50%) of the principals and teachers disagreed that teachers recognize the internet as a reference informational source (M=2.82, SD=1.17). This may also be an indication that teachers are averagely proficient in computer package applications. Further 83(62%) of the teachers indicate that the computer helps teachers to teach in more effective ways. This may be inferred that teachers have integrated information communication technology in teaching (M=3.42, SD=0.79). also, 39(100%) of the principals and teachers gave an affirmation that they are able to impact

learners to identify suitable software for application in their projects (M=2.08, SD=0.93).

#### 4.4.1 Teachers' Response Correlation Analysis

The objective of the investigation was to examine the correlation amongst teachers' competency and the integration of ICT in education, employing the Pearson correlation method. The outcomes of this analysis are detailed in Table 4.12.

**Table 4. 12: Correlation Analysis Teachers' Competency and Integration of ICT in Teaching and Learning**

		Competency	Integration
Competency	Pearson Correlation	1	.398
	Sig. (2-tailed)		.000
	N	105	105
Integration	Pearson Correlation	.398	1
	Sig. (2-tailed)	.000	.
	N	105	105

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

With a correlation coefficient of  $r(105) = 0.398$  and a significant p-value ( $0.000 < 0.5$ ), it is evident that a robust and positive correlation exists amongst teachers' competency and the integration of ICT in education. This finding underscores the significance of teachers' competency in effectively incorporating ICT into the learning processes.



### 4.3.2 Principals' Response Regression Analysis

A Simple Linear Regression analysis was conducted to assess the extent to which teachers' competency influences the integration of ICT in education.

The results of this analysis are presented in Table 4.13 4.13

**Table 4. 13: Model Summary**

<b>.Model</b>	<b>R</b>	<b>R Square</b>	<b>Adjusted R Square</b>	<b>Std. Error of the Estimate</b>
1		.398 <sup>a</sup>	.158	.147

a. Predictors: (Constant), Teachers' competency

In Table 4.13, the R-squared value is 0.013, indicating that teachers' competency accounts for 15.8% of the variability in the integration of ICT in teaching and learning. Additionally, a subsequent analysis revealed an ANOVA result with a p-value of 0.00, which is greater than 0.05. This suggests that the regression model is suitable for making forecasts.

**Table 4. 14: Relationship between Teachers’ Competency and Integration of ICT in Teaching and Learning**

ANOVA<sup>a</sup>

Model	Sum of					
	Squares	Df	Mean Square	F	Sig.	
1	Regression	46.831	1	46.831	13.913	.000 <sup>b</sup>
	Residual	249.089	103	3.366		
	Total	295.919	104			

**a. Dependent Variable: Integration of ICT in Teaching and Learning**

**b. Predictor: Teachers’Competency**

The p-value of less than 0.00 signifies the significance of the regression relationship in predicting the impact of teachers' competency on the adoption of ICT in education.

Furthermore, the investigator also investigated the degree to which the introduction of teachers' competency affects the integration of ICT in teaching and learning. The outcomes are presented in Table 4.15.

**Table 4. 15: Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	T	Sig.
1	(Constant)	-.139	.735		-.189	.851
	Teachers’ competency	.832	.223	.398	.398	.000

**a. Dependent Variable: Integration of ICT in Teaching and Learning**

Analyzing the outcomes in Table 4.15 reveals that when maintaining teachers' competency at a value of zero, the integration of ICT in teaching and learning is estimated to be -0.139. This implies that a one-unit rise in teachers' competency is associated with a 0.895 unit increase in the adoption of ICT in education.

**Inadequate pre-service training:** The teacher training curricula have not sufficiently integrated ICT training, as indicated by the consensus among teachers that their pre-service training before entering schools is limited. The lack of comprehensive training has led to resistance in adopting technological approaches to teaching and learning, a phenomenon similarly identified by Albirini (2007). Consequently, these insufficient training efforts leave teachers disadvantaged when it comes to effectively incorporating computer technology into their daily responsibilities.

The respondents were required to indicate how teachers' competency was improved.

In response they suggested that to improve ICT integration—understand the role of ICT in accordance with national education policies. Teachers need to consider and work towards the goals that should be achieved; teachers are encouraged to use ICT to improve educational methods. Teachers acquire skills and in a final phase, implement alternative, student-focused teaching strategies based on solving problems in a collaborative way.

Application of digital skills involves integrating technology into teachers' tasks linked to collaboration with other teachers and to planning. The most

important applications at this level are e-mail, social media and word processing and presentation programmes. The students were also asked to give their opinion on influence of teachers' competency on integration of ICT in teaching and learning in public secondary schools in Kinangop Sub-County, Nyandarua County.

**Table 4. 16: Students Response on Teachers' Competency on Integration of ICT in Teaching and Learning**

Statements	S		A		UN		D		SD		Mean	Stdv
	F	%	F	%	F	%	F	%	F	%		
Our teachers give reference to the internet as an informational source	-	-	96	40	24	10	9	40	24	10	2.80	1.07
Our teachers always use ICT in each lesson	24	10	120	50	48	20	48	20	-	-	3.50	0.92
If technical error occurour teachers know how to fix it	96	40	72	30	-	-	24	10	48	20	3.60	1.56
The computer helps teachers to teach in more effective ways	-	-	120	50	-	-	24	10	-	-	2.60	1.43

**(n=240, Average Mean=3.13)**

Table 4.16 gives an indication that 168(70%) of the students disagreed that if there is a technical error our teachers know how to fix it (M=3.60, SD=1.56). it could translate to the teaching staff being properly trained technically.

Further 144(60%) of the students indicate that their teachers always use ICT in each lesson. This may be inferred that teachers have integrated information communication technology in teaching.

In interviews, Sub County officers responsible for quality assurance and standards emphasized that they lacked specialized ICT teachers. This situation was particularly prevalent in day schools that adhered to the Ministry of Education's guidelines by not requesting additional fees from parents beyond the standard fees.

In a study conducted by Ghavifekr (2015) in Malaysia, it was found that a significant factor influencing the effectiveness of technology-based education was the presence of adequately prepared teachers for integrating ICT into teaching and learning. Similarly, Alazam, Abdullah, and Abidin (2012) conducted research to assess the extent of ICT skills and utilization among technical and vocational teachers in Malaysian classrooms. The results unveiled that the teachers' ICT skills were of a moderate level, and a majority (70%) of the surveyed teachers frequently incorporated ICT into their classroom teaching.

Belay, Khatete and Mugo (2020) conducted an investigation into the proficiency of teachers in integrating ICT into the teaching and learning of

Biology. The research encompassed 27 public secondary schools within the designated region. Employing a stratified random sampling technique, the study selected 12 secondary schools representing 12 sub-regions. The findings highlighted that a significant portion of Biology teachers lacked proper training in computer literacy. Despite participating in computer training sessions, their computer skills were deemed insufficient.

#### **4.5 Teachers' Attitude and Integration of ICT in Teaching and Learning**

The investigation's second goal intended to look at the manner teachers' attitudes impact the incorporation of ICT into the educational processes within public secondary schools located in Kinangop Sub-County, Nyandarua County

##### **4.5.1 Teachers' Attitude and Integration of ICT in Teaching and Learning**

The investigation aimed to ascertain the perspectives of principals regarding teachers' attitudes towards the adoption of ICT in education. The collected responses from principals are displayed in Table 4.17.

**Table 4. 17:Principals Response on Teachers' Attitude on Integration of ICT in Teaching and Learning**

Statements	S		A		UN		D		SD		Mean	Stdv
	F	%	F	%	F	%	F	%	F	%		
The teachers here often apply ICT in teaching	3	10	6	19	-	-	13	43	9	29	2.38	1.35
The classes are interesting whenever ICT is used	21	71	6	19	-	-	3	10	-	-	4.52	.92
Through ICT educational activities become increasingly interesting	3	10	27	90	-	-	-	-	-	-	4.90	.30
The adoption of ICT in classes boosts performance in national examinations.	19	62	6	19	6	19	-	-	-	-	4.42	.81
There is coverage of large content in shorter periods whenever ICTs are used	16	52	3	10	-	-	6	19	6	19	3.57	1.7
The practice of applying computers in educational activities make one skeptical.	19	62	3	10	-	-	9	29	-	-	4.04	1.35
<b>(n=30, Average Mean=3.72)</b>												

Table 4.17 gives an indication that 30(100%) of the principals agreed that through ICT educational activities become increasingly interesting (M=4.90, SD=0.30). Further 83(62%) of the principals indicate that the

lessons are interesting when ICTs are used. (M=4.52, SD=0.92). also, 23(81%) of the principals gave the affirmation that adoption of ICT in the class boosts performance at the national level. (M=4.42, SD=0.81). Mwanda (2017) established that the attitudes that teachers have towards integration of ICT ranges from avoidance, dislike, hatred, anxiety, enthusiasm and confidence in relation to the usefulness of the computers in personal and social life, a view that is also held by Semerci, Ali & Kemal (2018).

#### 4.5.1 Principals' Response Correlation Analysis

The aim here was to determine the correlation amongst teachers' attitudes towards integrating ICT in teaching and learning, utilizing the Pearson correlation coefficient. The outcomes of this analysis are outlined in Table 4.19

**Table 4. 18: Correlation Analysis Teachers' Attitude and Integration of ICT in Teaching and Learning**

		<b>Attitude</b>	<b>Integration</b>
<b>Attitude</b>	Pearson Correlation	1	.973
	Sig. (2-tailed)		.000
	N	30	30
<b>Integration</b>	Pearson Correlation	.973	1
	Sig. (2-tailed)	.000	.
	N	30	30



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

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The correlation coefficient for 30 data points is 0.973, with a p-value of less than 0.5 ( $p < 0.000$ ). it points to a and positive correlation amongst teachers' attitudes and the adoption of ICT in education. These findings underscore the significance of teachers' attitudes in the successful incorporation of ICT into educational practices.

A according Musumba ( 2019) formulation students' assessment through ICT has a number of benefits , such as, it minimizes on use of papers, it saves on the examiners time as one copy of exams may be administered to several learners online, it also enable the examiner to give a standard time for the examined. The challenges of use of ICT in students' assessment are that it requires knowledge and skills to operate the various applications used in administering online examination, it requires ICT equipments which may be costly to students, and it also need additional cost of internet and power supply which at times may be limited during examinations leading to disruption of exams.

#### **4.5.2 Principals' Response Regression Analysis**

A Simple Linear Regression analysis was conducted to assess the predictive capacity of teachers' attitudes concerning the integration of ICT in teaching and learning, as illustrated in Table 4.19.

**Table 4. 19: Model Summary**

<b>.Model</b>	<b>R</b>	<b>R Square</b>	<b>Adjusted R Square</b>	<b>Std. Error of the Estimate</b>
1		.973 <sup>a</sup>	.947	.26158

a. Predictors: (Constant), Teachers' Attitude

Table 4.19 displays an R-squared value of 0.947, indicating that teachers' attitudes account for 94.7% of the variance in the integration of ICT in teaching and learning. Subsequent analysis revealed an ANOVA p-value of 0.00 (>0.05), suggesting that the regression model is suitable for making predictions.

As per Tan and Mishra (2014), there exists a strong connection between teachers' attitudes and their utilization of technology. The researchers argue that teachers' perceived stance on employing technology in education significantly influences their willingness to incorporate ICT into the teaching and learning experience. If instructors possess positive attitudes towards utilizing ICT, they will find it easier to guide and manage interactive ICT platforms with their students. Andoh (2012) findings affirm that in order to cultivate positive attitudes towards ICT, teachers must possess adequate computer expertise to successfully adopt ICT.

**Table 4. 20: Relationship between Teachers' Attitude and Integration of ICT in Teaching and Learning**

ANOVA<sup>a</sup>

		Sum of				
Model		Squares	Df	Mean Square	F	Sig.
	Regression	23.107	1	23.107	337.692	.000 <sup>b</sup>
1	Residual	1.300	28	.068		
	Total	24.407	29			

**a. Dependent Variable: Integration of ICT in Teaching and Learning**

**b. Predictor: Teachers' Attitude**

A probability value of  $p < 0.00$  signifies the significance of the regression relationship in predicting the impact of teachers' attitude on the adoption of ICT in education. Furthermore, the investigator aimed to determine the extent to which the introduction of teachers' attitude affects the integration of ICT in teaching and learning. The outcomes are presented in Table 4.21.

**Table 4. 21:Coefficients<sup>a</sup>**

		Unstandardized		Standardized		
		Coefficients		Coefficients		
Model		B	Std. Error	Beta	T	Sig.
1	(Constant)	.199	.201		.994	.333
	Teachers' Attitude	.624	.056	.973	18.376	.000

**a. Dependent Variable: Integration of ICT in Teaching and Learning**

Derived from the findings presented in Table 4.21, it was evident that when maintaining teachers' attitude at a constant value of zero, the incorporation of ICT into educational processes would register at 0.199. Consequently, a one-

unit rise in teachers' proficiency would result in a 0.624-unit increase in the integration of ICT within the teaching and learning process.

An analysis by Adegbenro, Gumbo, and Olakanmi (2017) uncovered that teachers exhibited positive attitudes towards the incorporation of computers within their classrooms. They displayed a willingness to expand their knowledge about effectively integrating computers into the teaching and learning processes. Despite this enthusiasm, teachers encountered challenges in implementing ICT within their classroom practices. These challenges arose from their insufficient knowledge and lack of skills in utilizing ICT for pedagogical purposes.

According to the findings of Wambiri and Ndani (2016), teachers strongly believed that the use of ICT would not only benefit them in organizing instruction but also have positive impacts on their students. This perception of technology's usefulness to learners is crucial, as it enables teachers to stimulate learners' innovation and creativity (KICD, 2017; Waweru, 2018).

**Table 4. 22: Teachers' response on Teachers' Attitude and Integration of ICT in Teaching and Learning**

Statements	SA		A		UD		D		SD		Mean	Stdv
	F	%	F	%	F	%	F	%	F	%		
The teachers here often apply ICT in teaching	-	-	39	29	42	31	28	21	26	19	2.69	1.08
The classes are interesting whenever ICT is used	13	10	70	52	26	19	-	-	26	19	3.32	1.25

Through educational activities become increasingly interesting	13	10	41	30	42	31	39	29	-	-	3.20	0.97
The adoption of ICT in classes boosts performance in national examinations.	-	-	42	31	39	29	41	30	13	10	2.81	0.98
There is coverage of large content in shorter periods whenever ICTs are used	39	29	42	31	-	-	39	29	-	-	3.82	1.23
The practice of applying computers in educational activities make one skeptical.	13	10	39	29	27	20	56	42	-	-	3.06	1.04
<b>(n=135, Average Mean=3.15)</b>												

Table 4.22 demonstrates that 81 teachers, accounting for 60% of the total, concurred that the utilization of ICTs in lessons leads to the swift coverage of substantial content (Mean = 3.82, Standard Deviation = 1.23). This observation might suggest a requirement for ICT training among teachers to facilitate the seamless incorporation of ICT in their teaching methods. Additionally, a significant number of teachers, specifically 83 individuals or 62% of the total, indicated that the incorporation of ICTs in lessons results in heightened student engagement (Mean = 3.32, Standard Deviation = 1.25).

#### 4.5.2 Teachers' Response Correlation Analysis

The aim here was to ascertain the correlation between teachers' disposition towards incorporating ICT in education, utilizing the Pearson correlation method. The outcomes of this analysis are outlined in Table 4.23

#### **Table 4. 23: Correlation Analysis Teachers' Attitude and Integration of ICT in Teaching and Learning**

		<b>Attitude</b>	<b>Integration</b>
<b>Attitude</b>	Pearson Correlation	1	.596**
	Sig. (2-tailed)		.000
	N	105	105
<b>Integration</b>	Pearson Correlation	.596**	1
	Sig. (2-tailed)	.000	
	N	105	105

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

The computed correlation coefficient, denoted as  $r(30) = 0.596$ , with a p-value of  $(0.000) < 0.5$ , indicates a robust and positive association between teachers' proficiency and the adoption of ICT in education. This outcome underscores the significance of teachers' competence in effectively incorporating ICT into the educational process.

Langat, (2020) is in agreement with Musumba (2019) on the view that teachers' ability to formulate students assessment by use of ICT largely depends with teachers knowledge and skills to operate the ICT equipments. In addition Langat observes that for effective use of ICT there may be need of adequate supply of electricity, internet connection, and adequate photocopying papers for printing and adequate ICT gadgets such as students' laptops for students' online examinations.

#### **4.5.2 Teachers' Response Regression Analysis**

A Simple Linear Regression analysis was conducted to assess the predictive capability of teachers' attitude towards adopting ICT in education, as detailed in Table 4.24.

**Table 4. 24: Model Summary**

<b>.Model</b>	<b>R</b>	<b>R Square</b>	<b>Adjusted R Square</b>	<b>Std. Error of the Estimate</b>
1		.596 <sup>a</sup>	.355	.346

a. Predictors: (Constant), Teachers' Attitude

Table 4.24 displays an R Square value of 0.355, indicating that teachers' attitude accounts for 35.5% of the variability observed in the adoption of ICT in education. Additional analysis revealed an ANOVA result with a p-value of 0.00, which is less than 0.05. This suggests the regression model is well-suited for making predictions.

**Table 4. 25: Relationship between Teachers' Attitude and Integration of ICT in Teaching and Learning**

<b>ANOVA<sup>a</sup></b>						
<b>Model</b>		<b>Sum of Squares</b>	<b>Df</b>	<b>Mean Square</b>	<b>F</b>	<b>Sig.</b>
	Regression	23.107	1	23.107	337.692	.000 <sup>b</sup>
1	Residual	1.300	28	.068		
	Total	24.407	29			

**a. Dependent Variable: Integration of ICT in Teaching and Learning**

**b. Predictor: Teachers' Attitude**

A probability value of  $p < 0.001$  signifies the significance of the regression relationship in predicting the impact of teachers' attitudes on the adoption of ICT in education.

Additionally, the researcher aimed to determine the extent to which teachers' attitudes affect the adoption of ICT in education. . The corresponding findings can be observed in Table 4.26.

**Table 4. 26: Coefficients<sup>a</sup>**

Model		Unstandardized		Standardized		
		Coefficients		Coefficients		
		B	Std. Error	Beta	T	Sig.
1	(Constant)	-1.384	.634		-2.182	.032
	Teachers' Attitude	.797	.172	.596	6.379	.000

**a. Dependent Variable: Integration of ICT in Teaching and Learning**

The findings in Table 4.26 indicate that if teachers' attitudes are maintained at zero, adoption of ICT in education would be -1.384. Consequently, a one-unit rise in teachers' competency would result in a 0.797 unit increase in the adoption of ICT in education.

This means that ICT has a major influence towards education and it has enriched learning and teaching in schools. ICT has the potential to improve and support the education process.

From the interview it was established that integrating technology within education has generated a “more stimulating learning environment” and this technology has the possibilities to make the learning process more entertaining and innovative. For instance, some students use technology just



for enjoying and playing rather than focusing on important issues in their education.

Tan and Mishra (2014) emphasized the close connection between teachers' attitudes and their utilization of technology. The authors proposed that teachers' willingness to incorporate ICT into the teaching and learning process is notably shaped by their perceptions of technology's role in education. Having a positive outlook on ICT usage simplifies the task of educators in conducting interactive sessions through ICT with their students. Building upon this idea, Andoh (2012) highlighted the necessity for teachers to possess proficient computer skills to successfully integrate ICT into their teaching methods. This integration, in turn, plays a pivotal role in nurturing favorable attitudes towards ICT.

According to Kaino (2017), the crucial factors that influence a teacher's utilization of ICT include their personal beliefs and attitudes. The teacher's stance or conviction significantly influences the decision to incorporate and utilize technology in the classroom, and it also affects the outcome of this integration (Pierce and Ball, 2009). Consequently, this underscores the necessity for the teacher to cultivate a favorable attitude toward ICT among their students.

**Table 4. 27: Students Response on Teachers' Attitude and Integration of ICT in Teaching and Learning**

Statements	S		A		UN		D		SD		Mean	Stdv
	F	%	F	%	F	%	F	%	F	%		
The teachers at this school prefer to utilize ICT	-	-	48	20	48	20	96	40	48	20	2.40	1.02
Students perform exceptionally in their lessons when ICTs are integrated	48	20	48	20	24	10	48	20	24	10	3.40	1.28
ICT enhances the appeal of both teaching and learning, rendering them more captivating	24	10	96	40	48	20	72	30	-	-	3.30	1.00
The incorporation of ICT into lessons enhances students' outcomes in national examinations..	72	30	48	20	72	30	-	-	72	30	3.00	1.48

**(n=240, Average Mean=3.13)**

Table 4.27 indicates that 96(40%) of the students agreed that lessons run very well when ICTs are used (M=3.40, SD=1.28). Further 120(50%) of the students indicated that their teachers always use ICT in each lesson (M=3.30, SD=1.00). This may be inferred that teachers have integrated information communication technology in teaching. The way in which teachers approach and handle new material is predominantly shaped by their attitudes. If teachers hold unfavorable opinions about the objectives of an innovation, their attitude

can result in a lack of effective integration of the innovation. In the realm of implementing curriculum, the role of a teacher is pivotal. As the creator of the educational setting, the teacher's stance on integrating Information and Communication Technology (ICT) becomes incredibly significant.

The students were tasked with proposing alternate methods to enhance the integration of ICT through teachers' attitudes. In reply, there exists a robust connection between teachers' attitudes and their utilization of technology. The willingness of teachers to incorporate ICT into their educational practices is notably affected by their perceptions regarding technology's role in learning. Fostering positive attitudes towards ICT usage will streamline the teacher's ability to instruct and effectively engage learners through interactive ICT platforms.

Furthermore, students were requested to state how teacher's attitude improved students' performance. Whenever learners undergo negative attitude and bias in teaching methodologies by the teaching staff, they will have disappointment feelings, that consequently makes them demotivated and score poorly in class.

The findings of the study conducted by Wambiri and Ndani (2016) indicated that primary school teachers in Kenya held favorable opinions regarding the incorporation of diverse technologies in education. This suggests that with appropriate support, the integration (ICT) in school settings has the potential for success. The study's conclusion emphasized that teachers were not only confident in the advantages of utilizing ICT for instructional purposes

but also believed in its positive impact on their students. This aligns with the idea that teachers' perceptions of technology's significance for their students play a pivotal role in nurturing their creativity and originality (KICD, 2017; Waweru, 2018).

#### 4.6 ICT Instructional Materials and Integration of ICT in Teaching and Learning

The study's third aim was to investigate how ICT instructional materials impact the adoption of ICT in education within public secondary schools in Kinangop Sub-County, Nyandarua County. During the analysis, the mean and standard deviation were proficiently employed to illustrate both the measures of central tendency and dispersion.

##### 4.6.1 Principals Response on ICT Instructional Materials and Integration of ICT in Teaching and Learning

**Table 4.28: Principals Response on ICT Instructional Materials on Integration of ICT in Teaching and Learning**

Statements	S		A		UN		D		SD		Mean	Stdv
	F	%	F	%	F	%	F	%	F	%		
There exists ICT resources meant for educational purposes	9	29	3	10	-	-	13	43	6	19	2.85	1.59
Students have easy accessibility to ICT here	11	38	-	-	4	14	4	14	8	-	3.28	1.41
Teachers consistently use ICT in every	6	19	3	10	7	24	11	38	3	10	2.90	1.30

lesson														
The teaching staff allow learners to undertake tasks using the ICT	21	71	3	10	3	10	3	10	3	10	-	-	4.42	1.02
There are enough computers in the school	6	19	3	10	7	24	11	38	3	10			5.00	2.90
ICT makes learning interesting to students	18	62	3	10	-	-	9	29	-	-			4.04	1.35
Through ICT students are very active in class	11	38	4	14	-	-	14	48	-	-			3.42	1.43
<b>(n=30, Average Mean=3.72)</b>														

Table 4.28 gives an indication that 30(100%) of the principals agreed that there are enough computers in the institution (M=5.00, SD=2.90). Further 21(72%) of the principals indicate that ICT makes learning interesting to students (M=4.04, SD=1.35). also, 15(52%) of the principals gave an affirmation that through ICT learners are usually active in class(M=4.42, SD=0.81). If we consider level of literacy learning in a broader context involving accessing information, communication, and knowledge application, it becomes more probable that the incorporation of ICTs into educational processes will occur (Zhu, 2015). Put differently, ICTs enhance, expand, and revolutionize the role of language throughout the learning journey, serving as fundamental elements for acquiring general skills, competencies, applied knowledge, as well as basic skills or content conveyance. This is particularly relevant as these technologies introduce novel tools, mediums, and functions for learning in the digital era.

#### 4.5.1 Principals' Response Correlation Analysis

The study sought to establish the relationship between ICT Instructional Materials and integration of ICT in teaching and learning using Pearson correlation. The findings are presented in Table 4.29

**Table 4. 29: Correlation Analysis ICT Instructional Materials and Integration of ICT in Teaching and Learning**

		ICT Instructional	
		Materials	Integration
<b>ICT Instructional Materials</b>	Pearson Correlation	1	.980**
	Sig. (2-tailed)		.000
<b>Integration</b>	N	30	30
	Pearson Correlation	.980**	1
	Sig. (2-tailed)	.000	
	N	30	30

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

With a correlation coefficient of  $r(30) = 0.980$  and a p-value of  $(0.000) < 0.5$ , it is evident that a robust and positive correlation exists between ICT Instructional Materials and the adoption of ICT in education. This finding underscores the significance of ICT Instructional Materials in effectively incorporating ICT into learning processes.

#### 4.5.2 Principals' Response Regression Analysis

As can be seen in Table 4.30, a simple linear regression test was conducted to evaluate the predictive ability of ICT instructional materials on adoption of ICT in education .

**Table 4. 30: Model Summary**

<b>.Model</b>	<b>R</b>	<b>R Square</b>	<b>Adjusted R Square</b>	<b>Std. Error of the Estimate</b>
1		.980 <sup>a</sup>	.961	.959

a. Predictors: (Constant), ICT Instructional Materials

Table 4.30 displays an R Square value of 0.961, indicating that ICT Instructional Materials account for 96.1% of the variability in the integration of ICT in teaching and learning. Additional analysis revealed an ANOVA result with a p-value of 0.00, which is greater than 0.05. This suggests the regression model is suitable for predictive purposes.

**Table 4. 31: Relationship between ICT Instructional Materials and Integration of ICT in Teaching and Learning**

**ANOVA<sup>a</sup>**

<b>Model</b>	<b>Sum of Squares</b>	<b>Df</b>	<b>Mean Square</b>	<b>F</b>	<b>Sig.</b>
1 Regression	23.453	1	23.453	467.433	.000 <sup>b</sup>
1 Residual	.953	28	.050		
Total	24.407	29			

**a. Dependent Variable: Integration of ICT in Teaching and Learning**

**b. Predictor: ICT Instructional Materials**

A probability value of  $p < 0.001$  signifies the statistical significance of the regression relationship in predicting the impact of ICT Instructional Materials on the adoption of ICT in education.

Furthermore, the investigator aimed to determine the levels introduction of ICT Instructional Materials affects the integration of ICT in teaching and learning. The outcomes are captured in Table 4.32.

**Table 4. 32: Coefficients<sup>a</sup>**

Model		Unstandardized		Standardized		Sig.
		B	Std. Error	Beta	T	
1	(Constant)	.894	.140		6.375	.000
	ICT					
	Instructional	.821	.038	.980	21.620	.000
	Materials					

**a. Dependent Variable: Integration of ICT in Teaching and Learning**

Analyzing the outcomes in Table 4.32, it was noted that keeping ICT Instructional Materials constant at zero would result in an integration level of 0.894 for ICT in education. Consequently, a one-unit rise in teachers' competency would bring about a 0.821 unit increase in the adoption of ICT in education.

**4.6.2 Teachers' Responses on Instructional Materials and Integration of ICT in Teaching and Learning**



The aim here was to ascertain teachers' perspectives regarding the impact of ICT instructional materials on the adoption of ICT in education. The responses provided by teachers are displayed in Table 4.33.

**Table 4.33: Teachers Responses on Instructional Materials and Integration of ICT in Teaching and Learning**

Statements	S		A		UD		D		SD		Mean	Stdv
	F	%	F	%	F	%	F	%	F	%		
There is enough ICT resources for educational processes in the institution	13	10	26	19	28	21	42	31	26	19	2.68	1.25
Students have easy accessibility to ICT in the institution	13	10	27	20	-	-	56	42	39	29	2.40	1.34
Teachers consistently utilize ICT in every lesson	-	-	14	10	82	61	13	10	26	19	2.62	0.91
The teaching staff give learners room undertake tasks using the ICT	42	31	54	40	13	10	26	19	-	-	3.82	1.07
There are enough computers in the school	-	-	26	19	14	10	26	19	39	29	2.20	1.06
ICT makes learning interesting to students	13	10	53	39	28	21	56	42	39	29	3.18	1.16
ICT increases students' activeness in classes	13	10	53	39	28	21	28	21	13	10	3.88	0.83
<b>(n=105, Average Mean=2.96)</b>												

Table 4.33 indicates that 66(49%) of the teachers agreed that ICT increases students' activeness in classes (M=3.88, SD=0.83). Further 106(71%) of the teachers indicate that Teachers enable students to complete tasks utilizing ICT. This may be inferred that integration of information communication technology in teaching make lessons more interactive (M=3.82, SD=1.07). Al-Hariri and Al-Hattami (2017) assert that the Internet plays a pivotal role in facilitating the integration of technology within educational institutions. Scholars highlight that both the Internet and smartphone applications are ushering in an elevated degree of adaptability and flexibility to educational processes. This enhanced adaptability is achievable due to the inherent user-friendly nature of these technologies, allowing for seamless updates to content, personalized instructions, unfettered access to information, efficient information dissemination, and standardized content delivery.

#### **4.5.2 Teachers' Response Correlation Analysis**

The investigation intended to ascertain the correlation amongst ICT Instructional Materials and the adoption of ICT in education, utilizing the Pearson correlation. The results are showcased in Table 4.34.

**Table 4. 34: Correlation Analysis ICT Instructional Materials and Integration of ICT in Teaching and Learning**

	ICT Instructional	
	Materials	Integration

ICT	Pearson Correlation	1	.894**
Instructional Materials	Sig. (2-tailed)		.000
	N	105	105
Integration	Pearson Correlation	.894**	1
	Sig. (2-tailed)	.000	
	N	105	105

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

The correlation coefficient, with a value of  $r(30) = 0.894$  and a p-value of  $(0.000) < 0.5$ , indicates a robust and positive correlation between ICT Instructional Materials and the adoption of ICT in education. This finding suggests the significance of ICT Instructional Materials in the process of adopting ICT into education.

#### 4.5.2 Teachers' Response Regression Analysis

A Simple Linear Regression analysis was conducted to assess the predictive capability of ICT Instructional Materials concerning the adoption of ICT in education, as depicted in Table 4.36.

**Table 4. 35: Model Summary**

<b>.Model</b>	<b>R</b>	<b>R Square</b>	<b>Adjusted R Square</b>	<b>Std. Error of the Estimate</b>
1	.894 <sup>a</sup>	.800	.797	.89510

a. Predictors: (Constant), ICT Instructional Materials

Table 4.35 displays an R Square value of 0.894, indicating that ICT instructional materials account for 89.4% of the variance in the adoption of ICT in education. Additional examination reveals an ANOVA result with a P-

value of 0.00, which is less than 0.05. This suggests the regression model is suitable for making forecasts.

**Table 4. 36: Relationship between ICT Instructional Materials and Integration of ICT in Teaching and Learning**

**ANOVA<sup>a</sup>**

		Sum of				
Model		Squares	Df	Mean Square	F	Sig.
	Regression	104.980	1	104.980	40.686	.000 <sup>b</sup>
1	Residual	190.939	27	2.580		
	Total	295.919	29			

**a. Dependent Variable: Integration of ICT in Teaching and Learning**

**b. Predictor: ICT Instructional Materials**

The significance level of  $p < 0.00$  demonstrates that the regression relationship effectively predicts the impact of ICT Instructional Materials on the adoption of ICT in education.

Additionally, the investigator aimed to determine the extent to which the introduction of ICT instructional materials affects the adoption of ICT in education. The corresponding findings are detailed in Table 4.37.

**Table 4. 37: Coefficients<sup>a</sup>**

Model	Unstandardized		Standardized		Sig.
	B	Std. Error	Beta	T	
	<b>Coefficients</b>		<b>Coefficients</b>		

1	(Constant)	-1.014	.228		-4.442	.000
	ICT					
	Instructional	.484	.073	.894	17.186	.000
	Materials					

**a. Dependent Variable: Integration of ICT in Teaching and Learning**

Basing on the determinations above in Table 4.37, it was evident that maintaining ICT instructional materials at a constant value of zero resulted in an integration score of -1.014 for the incorporation of ICT in education. This implies that a one-unit increase in ICT instructional materials led to a corresponding increment of 0.484 units in the adoption of ICT in educational processes.

Teachers were tasked to propose alternative methods through which ICT instructional materials could enhance the adoption of ICT. Learning institutions employ a wide array of ICT tools for activities such as communication, content creation, information distribution, data storage, and information management. In certain contexts, ICT has become a fundamental component of the teacher-learner interaction. This is evidenced by practices such as the substitution of traditional chalkboards with interactive digital whiteboards, utilization of students' personal smartphones or other devices for learning within classroom hours, and the implementation of the "flipped classroom" model where students access lectures online at home and utilize class time for interactive collaborative exercises.

**Table 4. 38: Students Response on Instructional Materials and Integration of ICT in Teaching and Learning**

Statements	S		A		UN		D		SD		Mean	Stdv		
	F	%	F	%	F	%	F	%	F	%				
	Teachers in our school like using ICT in teaching	24	10	72	30	-	-	120	50	24			10	2.80
Students lessons intresting when ICTs are used	-	-	72	30	72	30	30	12.5	72	30	24	10	2.80	0.98
ICT makes teaching and learning more interesting	24	10	72	30	72	30	30	12.5	72	30	-	-	3.10	1.04
Integration of ICT in lessons improves my performance in national examinations.	24	10	96	40	-	-	96	40	24	10	3.00	1.26		

**(n=240, Average Mean=2.92)**

Table 4.38 indicates that 96(40%) of the students agreed that ICT makes teaching and learning more interesting (M=3.10, SD=1.04).

Further 120(50%) of the students indicate that integrating ICT in classes improves performance nationally (M=3.00, SD=1.26). This may be inferred

that teachers have integrated of information communication technology in teaching.

When teachers are digitally literate and trained to use ICT, can lead to higher order thinking skills, provide creative and individualized options for students to express their understandings, and leave students better prepared to deal with ongoing technological change in society and the workplace. ICT issues planners must consider include: considering the total cost-benefit equation, supplying and maintaining the requisite infrastructure, and ensuring investments are matched with teacher support and other policies aimed at effective ICT use.

#### **4.7 ICT Infrastructure and integration of ICT in Teaching and Learning**

The study's fourth aim was to evaluate the manner presence of ICT infrastructure affects the incorporation of ICT into teaching and learning within public secondary schools in Kinangop Sub-County, Nyandarua County. During the analysis, the mean and standard deviation were skillfully employed to illustrate both the measures of dispersion and central tendency.

##### **4.7.1 Principals Responses on ICT Infrastructure and Integration of ICT in Teaching and Learning**

The investigation aimed to ascertain the perspectives of school principals regarding the impact of ICT infrastructure on the adoption of ICT in education within public secondary schools. The responses provided by the principals are displayed in Table 4.39.

**Table 4. 39: ICT Infrastructure and Integration of ICT in Teaching and Learning**

Statements	SA		A		UN		D		SD		Mean	Stdv
	F	%	F	%	F	%	F	%	F	%		
Easily get electronic information useful for teaching and learning	14	48	-	-	3	10	6	19	7	24	3.28	1.76
Use Internet for research purposes in preparation for my lessons	11	38	9	29	3	10	4	14	3	10	3.71	1.38
The school has subscribed to sources that provide information for teaching and learning	27	90	-	-	-	-	3	10	-	-	4.71	.90
The school has installed surveillance gadgets to follow up on students/pupils and teachers	17	57	3	10	3	10	4	14	3	10	3.90	1.48
Use of smartphone to access a student's/pupil's profile for easy follow up	6	19	6	19	-	-	19	62	-	-	2.95	1.28
Use a tablet to monitor student/pupils' activities in class and other areas	20	67	7	24	3	10	-	-	-	-	4.57	.67
Can alert staff to signs of bad or inappropriate behavior using technologies	9	29	11	38	-	-	7	24	3	10	3.52	1.40
<b>(n=30, Average Mean=3.08)</b>												

Table 4.39 presents data showing that 30 (100%) of the principals concurred that they utilize tablets to oversee students' activities both in the classroom and other areas (Mean = 4.57, Standard Deviation = 0.67). Additionally, 21 (72%) of the principals reported that their schools have subscribed to resources providing information for teaching and learning (Mean = 4.71, Standard Deviation = 0.90). Furthermore, 15 (52%) of the principals confirmed the use of tablets for monitoring student activities in class and other



areas (Mean = 4.57, Standard Deviation = 0.67). Liang et al. (2015) conducted a study over six years on the digital classroom environment and found that several fundamental amenities are crucial for the integration of ICT. They argue that for technology to be utilized effectively in the classroom, there needs to be provision for teacher and student devices, shared display projectors, network access, and other supporting equipment. Mingaine (2016) corroborates this assertion by highlighting the indispensability of electricity, computer hardware, software, and connectivity to achieve successful ICT integration.

#### 4.7.1 Principals' Response Correlation Analysis

The research aimed to determine the correlation amongst ICT infrastructure and the adoption of ICT in education using the Pearson correlation. Findings are captured in Table 4.40.

**Table 4. 40: Correlation Analysis ICT Infrastructure and Integration of ICT in Teaching and Learning**

		ICT	
		Infrastructure	Integration
<b>ICT</b>	Pearson Correlation	1	.664**
	Sig. (2-tailed)		.000
<b>Infrastructure</b>	N	30	30
	Pearson Correlation	.664**	1
	Sig. (2-tailed)	.000	

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

---

With a correlation coefficient of  $r(30) = 0.664$  and a p-value of  $(0.000) < 0.5$ , it becomes evident that a positive association exists between ICT infrastructure and the adoption of ICT in education. This deduction underscores the significance of ICT instructional materials in the process of incorporating ICT effectively into teaching and learning approaches.

In Makueni County Secondary Schools in Kenya, Ndolo (2020) research also uncovered that, even though certain ICT tools for biology teaching were available, most teachers rarely utilized them or actively encouraged their students to use ICT for biology. The study concluded that the primary obstacles to integrating ICT into biology teaching included: inadequate or insufficient access to ICT resources, unreliable electricity supply, limited space or the absence of laboratories within the institution, lack of proficiency or awareness in ICT usage, economic challenges in procuring ICT materials, insufficient time for ICT utilization, and reduced ICT infrastructure.

#### **4.7.2 Principals' Response Regression Analysis**

A Simple Linear Regression analysis was conducted to ascertain the predictive capability of ICT infrastructure concerning the adoption of ICT in education, as demonstrated in Table 4.41.

#### **Table 4. 41: Model Summary**

	<b>Std. Error of the</b>				
<b>.Model</b>	<b>R</b>	<b>R Square</b>	<b>Adjusted R Square</b>	<b>Estimate</b>	
1	.664 <sup>a</sup>	.441	-.019	.17809	

a. Predictors: (Constant), **ICT Infrastructure**

Table 4.41 illustrates an R-squared value of 0.664, indicating that ICT infrastructure accounts for 96.1% of the variance in the integration of ICT in teaching and learning. Additional analysis revealed an ANOVA result with a p-value of 0.00, which is greater than 0.05, suggesting that the regression model is suitable for predictive purposes.

**Table 4. 42: Relationship between ICT Infrastructure and Integration of ICT in Teaching and Learning**

<b>ANOVA<sup>a</sup></b>						
<b>Model</b>		<b>Sum of Squares</b>	<b>Df</b>	<b>Mean Square</b>	<b>F</b>	<b>Sig.</b>
1	Regression	23.453	1	23.453	467.433	.000 <sup>b</sup>
	Residual	.953	28	.050		
	Total	24.407	29			

**a. Dependent Variable: Integration of ICT in Teaching and Learning**

**b. Predictor: ICT Infrastructure**

The probability value of  $p < 0.00$  signifies the significance of the regression relationship in predicting the influence of ICT infrastructure on the adoption of ICT in education

The investigator additionally aimed to determine the extent to which the implementation of ICT Infrastructure impacts the incorporation of ICT in the realm of teaching and learning. The outcomes are presented in Table 4.43.

**Table 4. 43: Coefficients<sup>a</sup>**

Model		Unstandardized		Standardized		Sig.
		B	Std. Error	Beta	T	
1	(Constant)	-.024	.033		-.711	.479
	<b>ICT</b>					
	<b>Infrastruct</b>	.774	.010	.996	96.209	.000
	<b>ure</b>					

**a. Dependent Variable: Integration of ICT in Teaching and Learning**

Looking at the findings in Table 4.43, it was noted that when maintaining ICT Infrastructure at a fixed value of zero, the adoption of ICT in education was measured at -0.024. Consequently, a one-unit rise in ICT Infrastructure would result in a corresponding increase of 0.774 units in the adoption of ICT within the realm of teaching and learning.

#### 4.7.2 Teachers' Responses on ICT Infrastructure and Integration of ICT in Teaching and Learning

**Table 4. 44: ICT Infrastructure and Integration of ICT in Teaching and Learning**

Statements	S		A		UN		D		SD		Mean	Stdv
	F	%	F	%	F	%	F	%	F	%		
Easily get electronic information useful for educational events	-	-	14	10	14	10	68	50	39	29	2.02	.90
Use Internet for research purposes in preparation for my lessons	13	10	27	20	42	31	27	20	26	19	2.80	1.23
The school has subscribed to sources that provide information for teaching and learning	-	-	40	30	28	21	41	30	26	19	2.60	1.10
The school has installed surveillance gadgets to follow up on students/pupils and teachers	13	10	54	40	42	31	13	10	13	10	3.30	1.08
Use of smartphone to access a student's/pupil's profile for easy follow up	13	10	13	10	39	29	42	31	28	21	2.56	1.20
Use a tablet to monitor student/pupils' activities in class and other areas	28	21	41	30	13	10	40	30	13	10	3.22	1.33
Can alert staff to signs of bad or inappropriate behavior using technologies	-	-	-	-	27	20	68	50	40	30	1.90	0.70

(n=105, Average Mean=3.08)

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Table 4.44 gives the indication that 69(51%) of the principals and teachers agreed that use a computer to monitor student/pupils' activities in class and other areas (M=3.22, SD=1.33). Further 20(48%) of the principals and teachers indicate that the school has installed surveillance gadgets to follow up on students/pupils and teachers (M=3.30, SD=1.08). Moreover, 53(39%) of the geography teachers affirmed that use Internet for research purposes in preparation for my lessons (M=2.80, SD=1.23).

#### 4.7.1 Teachers' Response Correlation Analysis

The investigation here intended to determine the correlation between ICT Infrastructure and the integration of ICT in educational instruction and learning through the utilization of Pearson correlation. The outcomes are showcased in Table 4.45.

**Table 4. 45: Correlation Analysis ICT Infrastructure and Integration of ICT in Teaching and Learning**

---

		ICT	
		Infrastructure	Integration
<b>ICT</b>	Pearson Correlation	1	.987**
<b>Infrastructure</b>	Sig. (2-tailed)		.000
<b>re</b>	N	105	105
<b>Integration</b>	Pearson Correlation	.987**	1
	Sig. (2-tailed)	.000	

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

---

The correlation coefficient, denoted as  $r(30) = 0.987$ , with a p-value of (0.000)  $< 0.5$ , indicates a robust positive correlation between ICT Infrastructure and the integration of ICT in educational instruction and learning. This outcome suggests that ICT Infrastructure plays a significant role in the integration of ICT within the context of teaching and learning.

#### 4.7.2 Teachers' Response Regression Analysis

Simple Linear regression test was run to determine the predictive power of ICT Infrastructure on integration of ICT in teaching and learning as shown in Table 4.46.

**Table 4. 46: Model Summary**

.Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.980 <sup>a</sup>	.961	.959	.22400

a. Predictors: (Constant), **ICT Infrastructure**

---

Table 4.46 presents an R Square value of 0.961, signifying that ICT Infrastructure accounts for 96.1% of the variability observed in the integration of ICT within educational instruction and learning. Subsequent analysis revealed an ANOVA result with a p-value of 0.00, which is greater than 0.05.

This suggests that the regression model is suitable for making predictions, as it fits the data well.

**Table 4. 47: Relationship between ICT Infrastructure and Integration of ICT in Teaching and Learning**

ANOVA <sup>a</sup>						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	23.786	1	23.786	728.013	.000 <sup>b</sup>
	Residual	.621	103	.033		
	Total	24.407	104			

**a. Dependent Variable: Integration of ICT in Teaching and Learning**

**b. Predictor: ICT Infrastructure**

A probability value of  $p < 0.00$  signifies the significance of the regression relationship in predicting the impact of ICT Infrastructure on the adoption of ICT in education.

Furthermore, the investigator aimed to determine the levels introduction of ICT Infrastructure affects the adoption of ICT in education. The outcomes are displayed in Table 4.48.

**Table 4. 48: Coefficients<sup>a</sup>**

Model		Unstandardized		Standardized		Sig.
		B	Std. Error	Beta	T	
1	(Constant)	.683	.120		5.707	.000



ICT					
<b>Infrastructure</b>	.857	.032	.987	26.982	.000

**a. Dependent Variable: Integration of ICT in Teaching and Learning**

The findings from Table 4.48 demonstrate that when keeping ICT Infrastructure constant at zero, the adoption of ICT in education is projected to be 0.683. This suggests that a one-unit rise in ICT Infrastructure would correspond to a 0.857 unit increase in the adoption of ICT in education.

From the interviews it was established integrating ICT in education can help students to enhance their competence and awareness. This means students have the ability to make decisions and solve problems. Implementing ICT in learning and teaching enhances assessment for learning and teaching in schools and higher education.

Principals and teachers were requested to describe the manner of ICT infrastructure presence improves ICT integration. Since the infrastructure of the schools is mainly provided through nationwide programs by the Ministry of Education. This means that even today the lack of ICT infrastructure is a significant obstacle to ICT integration for most of the public school teachers. The Ministry of Education has been trying to upgrade the technological infrastructure and so far has managed to supply several school classrooms with video-projectors and to connect schools to the internet via broadband lines. However, taking into account the current financial situation, the

installation of a computer-video projector system in every school classroom is probably the best thing we can expect to happen, in the next couple years.

**Table 4. 49: Students Response on ICT Infrastructure and Integration of ICT in Teaching and Learning**

Statements	S		A		UN		D		SD		Mean	Stdv
	F	%	F	%	F	%	F	%	F	%		
	Easily get electronic information useful for teaching and learning	24	10	48	20	48	20	72	30	48		
Use Internet for research purposes in preparation for my lessons	-	-	24	10	48	20	72	30	96	40	2.00	1.00
The school has subscribed to sources that provide information for teaching and learning	-	-	72	30	24	10	72	30	72	30	2.40	1.20
The school has installed surveillance gadgets to follow up on students/pupils and teachers	-	-	48	20	24	10	120	50	48	20	2.30	1.00

**(n=240, Average Mean=2.35)**

Table 4.48 indicates that 120 (50%) of the students agreed that ... easily get electronic information useful for learning (M=2.70, SD=1.27). Further 144(60%) of the students indicate that the school has subscribed to sources that provide information for teaching and learning (M=2.40, SD=1.20).The school has installed surveillance gadgets to follow up on students/pupils and teachers (M=2.30, SD=1.00).

In order to successfully implement ICT policies in education, it is crucial to have sufficient infrastructure and resources in place. Liang and colleagues (2015) conducted a study based on six years of experience in analyzing digital classroom environments. They suggest that certain essential facilities are indispensable for the integration of ICT. According to their findings, for the optimal utilization of technology in educational settings, classrooms must be equipped with devices for both students and teachers, shared display projectors, network connectivity, and other supporting installations. This viewpoint is supported by Mingaine (2016), who emphasizes the significance of facilities such as power, computer devices, software, and connectivity in ensuring effective integration of ICT.

## **CHAPTER FIVE**

### **SUMMARY, CONCLUSIONS AND RECOMMENDATIONS**

#### **5.1 Introduction**

The aim of this research was to examine how school-based factors affect the incorporation of information communication and technology into teaching and learning within public secondary schools in Kinangop Sub-County, Nyandarua County, Kenya. This chapter entails a comprehensive analysis of the results, draws conclusions, provides recommendations, and proposes directions for future research.

#### **5.2 Summary of the Study**

The research investigated the impact of school-related factors on the incorporation of Information Communication and Technology (ICT) into the teaching and learning process within public secondary schools in Kinangop Sub-County, Nyandarua County, Kenya. The research focused on several variables aligned with its objectives:

To ascertain the influence of teachers' competence on the integration of ICT in teaching and learning within public secondary schools.

To analyze the attitudes of teachers toward the integration of ICT in teaching and learning in public secondary schools.

To identify the methods through which ICT instructional materials are applied in the integration of ICT into teaching and learning in public secondary schools.

To investigate the role of ICT infrastructure in the integration of ICT into teaching and learning in public secondary schools.

The study drew guidance from Roger's Diffusion of Innovation theory (2003) to provide a theoretical framework for understanding the adoption and implementation of technological innovations within an educational context. The conceptual framework illustrated the interconnectedness between the independent and dependent variables.

A descriptive research design was chosen due to its appropriateness in capturing insights, attitudes, behaviors, and values that characterize the current situation. The study's target population included 30 principals, 365 teachers, 1 Sub County Director of Education, 1 Sub County Quality Assurance Officer, and 3078 students in the fourth year of schooling from the identified schools.

Stratified sampling was employed to select schools for inclusion in the study. The complete sample for the study consisted of 30 principals, 109 teachers, and 308 fourth-year (form four) students from the chosen schools.

To enhance the reliability of the research tools, they underwent testing and retesting. To ensure validity, input was sought from university supervisors. The selection of teachers was carried out using stratified random sampling. The data analysis was performed using SPSS Computer Software version 23.0 due to its effectiveness and efficiency in handling substantial data

volumes. The results corresponding to each objective are succinctly summarized in the subsequent sections.

### **5.2.1 Teachers' Competency and Integration of ICT in Teaching and Learning in Public Secondary Schools in Kinangop Sub-County, Nyandarua County.**

The first objective of the study was to determine the level of teachers' competence in integrating ICT into teaching and learning within public secondary schools in Kinangop Sub-County, Nyandarua County. The results showed a significant statistical correlation, as indicated by principals and teachers (Mean = 2.61, Pearson's  $r = 0.034$ ,  $p < 0.05$ ). It was revealed that 69 (50%) of both principals and teachers held the opinion that teachers don't often use the internet as a source of information (Mean = 2.82, Standard Deviation = 1.17). Furthermore, a majority of 168 (70%) students disagreed with the statement that our teachers know how to fix things when something goes wrong (Mean = 3.60, Standard Deviation = 1.56).

### **5.2.2 Teachers' Attitude and Integration of ICT in Teaching and Learning in Public Secondary Schools in Kinangop Sub-County, Nyandarua County.**

The study's second aim was to assess the perspective of educators regarding the incorporation of Information and Communication Technology (ICT) into teaching and learning within public secondary schools in Kinangop Sub-County, Nyandarua County. The results demonstrated statistical significance according to assessments made by both principals and teachers

(Mean = 3.15, Pearson's  $r = 0.423$ ,  $p < 0.05$ ). The findings revealed that 81 (60%) of the surveyed principals and teachers concurred that the utilization of ICTs in lessons led to the coverage of a substantial amount of content in a short span of time (Mean = 3.82, Standard Deviation = 1.23). Furthermore, it was observed that 96 (40%) of the students agreed that lessons were greatly enhanced when ICTs were integrated (Mean = 3.40, Standard Deviation = 1.28).

### **5.2.3 ICT Instructional Materials and Integration of ICT in Teaching and Learning in Public Secondary Schools in Kinangop Sub-County, Nyandarua County.**

The third objective of the research was to identify approaches through which instructional materials related to Information and Communication Technology (ICT) regarding its integration into teaching and learning were used in public secondary schools within Kinangop Sub-County, Nyandarua County. The results revealed statistically significant outcomes for principals and teachers (with a mean of 2.96, a correlation coefficient of 0.053, and a  $p$ -value less than 0.05). The investigation indicated that 66 teachers (49%) concurred that the utilization of ICT enhances student engagement during lessons (with a mean of 3.88 and a standard deviation of 0.83). Additionally, 96 students (40%) affirmed that the use of ICT enhances the appeal of teaching and learning (with a mean of 3.10 and a standard deviation of 1.04).



#### **5.2.4 ICT Infrastructure and Integration of ICT in Teaching and Learning in Public Secondary Schools in Kinangop Sub-County, Nyandarua County.**

The fourth aim of the study was to assess how the ICT infrastructure affects the incorporation of ICT into the teaching and learning process within public secondary schools in Kinangop Sub-County, Nyandarua County. The results revealed a statistically significant impact, as reported by both principals and teachers (Mean = 3.08, Pearson's  $r = 0.328$ ,  $p < 0.05$ ). The investigation discovered that 69 individuals (51%), comprising principals and teachers, concurred that computers are utilized to monitor students' activities in class and other areas (Mean = 3.22, Standard Deviation = 1.33). Additionally, 20 participants (48%) among the principals and teachers noted that the school has implemented surveillance devices to oversee both students and teachers (Mean = 3.30, Standard Deviation = 1.08).

Furthermore, a total of 120 students (50%) expressed their agreement with the ease of accessing electronic information that is beneficial for their learning and instruction (Mean = 2.70, Standard Deviation = 1.27). Moreover, 144 students (60%) indicated that their school has enrolled in resources that furnish information for teaching and learning (Mean = 2.40, Standard Deviation = 1.20).

#### **5.3 Conclusion**

The research questions and findings of the study lead to the following conclusions:

Integrating ICT into secondary school teaching offers teachers the opportunity for professional improvement through ICT-focused in-service courses, given conducive conditions. This avenue enables teachers to revolutionize education, thereby aiding students in gaining confidence and enthusiasm for new technologies through familiarity with ICT applications. To advocate for ICT integration within their institutions, school principals must possess effective strategies and resource mobilization skills.

#### **5.4 Recommendations**

Based on the study's findings, the researcher offers the following recommendations:

- i. It is advised that the Ministry of Education and other relevant policy makers such as KICD contemplate the inclusion of ICT as a fundamental subject within the secondary school curriculum. This incorporation of ICT as a core subject is expected to positively influence students' attitudes toward ICT, as it will be perceived as equally indispensable as other subjects taught in school.
- ii. It is crucial for school principals and the Board of Management (BOM) to facilitate in-service training in ICT, specifically in areas such as networking,

pedagogy, technical aspects, and societal considerations. This training is vital to ensure the competence of individuals in effectively utilizing ICT resources, leading to proficient computer utilization. Additionally, training should extend to older and more experienced teachers.

iii. Substantial government investment is recommended to ensure an ample supply of computers within schools and to enhance internet connectivity. This effort aims to facilitate seamless access to educational materials on the web, thus promoting effective teaching and learning.

#### **5.5. Suggestion for Further Study**

i. Subsequent research endeavors should delve into the investigation of ICT adoption not only among principals but also across diverse educational tiers such as pre-schools, primary schools, teacher training colleges, and higher education institutions. This comprehensive approach will yield insights into ICT integration at various educational levels.

ii. It's worth noting that the present study was confined to a singular sub-County. To broaden the scope, it is suggested that a comparable study be conducted across different sub-Counties. This extension will contribute to a more comprehensive understanding of the subject matter.

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## APPENDICES

### APPENDIX I: LETTER OF INTRODUCTION

Department of Educational Administration and Planning

University of Nairobi

P.O. BOX 30197

Nairobi

Dear Sir/Madam,

#### **REQUEST FOR COLLECTION OF RESEARCH DATA**

I am a Master of Education (M.Ed.) student at the University of Nairobi. As part of the requirement for the award of the degree, I am expected to undertake a research study. The study examines “**Influence of school-based factors on integration of Information Communication and Technology in teaching and learning in public secondary schools in Kinangop Sub-County Nyandarua County, Kenya.**” Information obtained will be purely for the purpose of this research and the identity of the respondents will be treated as strictly confidential. Please fill in the questionnaires.

Your cooperation will be appreciated.

Yours sincerely,

Hottensia Mwaura

**APPENDIX II: QUESTIONNAIRE FOR PRINCIPALS AND  
TEACHERS**

Information provided through the questionnaire will be treated with confidentiality and will be exclusively for academic purpose. TICK THE MOST APPROPRIATE. All answers will be considered right.

**SECTION A: DEMOGRAPHIC INFORMATION**

1. Kindly indicate your Designation.

Teacher [ ] Principal [ ]

2. What is your gender?

Male [ ] Female [ ]

3. Indicate your age bracket.

Below 30 years [ ] 30 – 40 years [ ]

40-50 years [ ]. 50-60 years [ ]

4. Indicate your highest academic qualification.

Diploma Level [ ] Masters Level [ ]

Degree level [ ] Doctorate/PhD Level [ ]

Any other (Specify) \_\_\_\_\_

5. Please show how long you have served in your current position.

Less than 5 years [ ] 16 – 20 years [ ]

6 – 10 years [ ] More than 21 years [ ]

11– 15 years [ ]

**SECTION B: TEACHERS' COMPETENCY AND ICT INTEGRATION**

6. To what extent do you agree with the following statements on teachers' competency and ICT integration? Key: 5 strongly agree, 4 agree, 3 undecided, 2 disagree, 1 strongly disagree (please put an X as appropriate).

<b>Teachers' Competency</b>	1	2	3	4	5
Teachers give reference to the internet as source of information					
Teachers always use ICT in each lesson					
The Computer is not Conducive to good teaching because it creates technical problems					
The computer helps teachers to teach in more effective ways					
I can select appropriate software to use in my teaching					
I can teach my students to select appropriate software to use in their projects					

7. Suggest other ways that teachers' competency and ICT integration

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 .....  
 .....

8. How can teacher's competency be improved to improve ICT integration

.....  
 .....

**SECTION C: ATTITUDE OF TEACHERS' AND ICT INTEGRATION**

9. To what extent do you agree with the following attitude of teachers' and ICT integration? Key: 5 strongly agrees, 4 agree, 3 undecided, 2 disagree, 1 strongly disagree (please put an X as appropriate).

<b>Attitude of Teachers'</b>	1	2	3	4	5
Teachers in this school like using ICT in teaching					
Students lessons are interesting when ICTs are used					
ICT makes teaching and learning more interesting					
Integration of ICT in lessons improves students' performance in national examinations.					
Much content is covered within a short time when ICTs are used in lessons					
The idea of using the computer in teaching and learning make me skeptical					

**10.** Suggest other ways that attitude of teachers improve ICT integration

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

**11.** How has teacher's attitude improved students' performance?

.....  
 .....



**SECTION D: ICT INSTRUCTIONAL MATERIALS AND ICT**

**INTEGRATION**

12. To what extent do you agree with the following statements on ICT Instructional Materials and ICT integration? Key: 5 strongly agrees, 4 agree, 3 undecided, 2 disagree, 1 strongly disagree (please put an X as appropriate).

<b>ICT Instructional Materials</b>	1	2	3	4	5
There are ICT resources for teaching and learning in the school					
Students can easily access the various ICT in this school					
Teachers always use ICT in each lesson					
Teachers allow students to perform tasks using the ICT					
There are enough computers in the school					
ICT makes learning interesting to students					
ICT makes the students to be active in the lessons					

**13.** Suggest other ways can instructional materials improve ICT integration

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.....

.....

**14.** How can instructional materials improve ICT integration?

.....

.....

.....

**SECTION E: ICT INFRASTRUCTURE AND ICT INTEGRATION**

15. To what extent do you agree with the following statements on ICT Infrastructure and ICT integration? Key: 5 strongly agrees, 4 agree, 3 undecided, 2 disagree, 1 strongly disagree (please put an X as appropriate).

<b>ICT Infrastructure</b>	1	2	3	4	5
Easily get electronic information useful for teaching and learning					
Use Internet for research purposes in preparation for my lessons					
The school has subscribed to sources that provide information for teaching and learning					
The school has installed surveillance gadgets to follow up on students/pupils and teachers					
Use computer to access a student's/pupil's profile for easy follow up					
Use a computer to monitor student/pupils' activities in class and other areas					
Can alert staff to signs of bad or inappropriate behavior using technologies					

16. Suggest other ways that ICT infrastructure can improve ICT integration

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 .....  
 .....

17. Describe how availability of ICT infrastructure can improve ICT integration

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

**SECTION F: INTEGRATION OF INFORMATION COMMUNICATION AND TECHNOLOGY**

18. To what extent do you agree with the following statements on integration of information communication and technology? Key: 5 strongly agrees, 4 agree, 3 undecided, 2 disagree, 1 strongly disagree (please put an X as appropriate).

<b>Integration of Information Communication And Technology</b>	1	2	3	4	5
The administration is supportive on the use of ICT					
ICT makes teaching and learning interesting					
The administration in this school advocates for the use of ICT in teaching and learning					
Teachers use of computers in during teaching and learning					

School Administration has adequate ICT applications					
There is adequate Electronic Information Resources Access					
There is collaborative teaching and learning					
The principal encourages me to integrate computers in teaching and learning					

19. How can integration of information communication and technology be improved?

.....

.....

**Thank you for your participation**

**APPENDIX III: QUESTIONNAIRE FOR STUDENTS**

**SECTION A: DEMOGRAPHIC INFORMATION**

1. What is your gender? (Please tick appropriately)

Male [    ]      Female      [    ]

2. Indicate your age bracket.

Below 15 years [    ] 15 – 18 years [    ] 19-21 years [    ] 22 years  
[    ]

**SECTION B: TEACHERS’ COMPETENCY AND ICT INTEGRATION**

5. To what extent do you agree with the following statements on teachers’ competency and ICT integration? Key: 5 strongly agree, 4 agree, 3 undecided, 2 disagree, 1 strongly disagree (please put an X as appropriate).

<b>Teachers’ Competency</b>	1	2	3	4	5
Our teachers give reference to the internet as source of information					
Our teachers always use ICT in each lesson					
If something goes wrong our teachers know how to fix it					
The computer helps teachers to teach in more effective ways					

6. Suggest other ways that teachers’ competency and ICT integration

.....

.....

.....

.....

**SECTION C: ATTITUDE OF TEACHERS' AND ICT INTEGRATION**

7. To what extent do you agree with the following attitude of teachers' and ICT integration? Key: 5 strongly agrees, 4 agree, 3 undecided, 2 disagree, 1 strongly disagree (please put an X as appropriate).

<b>Attitude of Teachers'</b>	1	2	3	4	5
Teachers in this school like using ICT in teaching					
Students lessons very well when ICTs are used					
ICT makes teaching and learning more interesting					
Integration of ICT in lessons improves students' performance in national examinations.					

8. Suggest other ways that attitude of teachers improve ICT integration

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

**SECTION D: ICT INSTRUCTIONAL MATERIALS AND ICT INTEGRATION**

9. To what extent do you agree with the following statements on ICT Instructional Materials and ICT integration? Key: 5 strongly agrees, 4 agree, 3 undecided, 2 disagree, 1 strongly disagree (please put an X as appropriate).

<b>ICT Instructional Materials</b>	1	2	3	4	5
There are ICT resources for teaching and learning in the school					

Students can easily access the various ICT in this school					
Teachers allow students to perform tasks using the ICT					
Teachers use laptops and projectors in teaching					

**10. Suggest other ways can instructional materials improve ICT integration**

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**SECTION E: ICT INFRASTRUCTURE AND ICT INTEGRATION**

11. To what extent do you agree with the following statements on ICT

Infrastructure and ICT integration? Key: 5 strongly agrees, 4 agree, 3

undecided, 2 disagree, 1 strongly disagree (please put an X as appropriate).

<b>ICT Infrastructure</b>	1	2	3	4	5
Easily get electronic information useful for teaching and learning					
Use Internet for research purposes in preparation for my lessons					
The school has subscribed to sources that provide information for teaching and learning					
The school has installed surveillance gadgets to follow up on students/pupils and teachers					

12. Suggest other ways that ICT infrastructure can improve ICT integration

.....  
 .....

**SECTION F: INTEGRATION OF INFORMATION COMMUNICATION AND TECHNOLOGY**

13. To what extent do you agree with the following statements on integration of information communication and technology? Key: 5 strongly agrees, 4 agree, 3 undecided, 2 disagree, 1 strongly disagree (please put an X as appropriate).

<b>Integration of Information Communication And Technology</b>	1	2	3	4	5
The administration is supportive on the use of ICT					
ICT makes teaching and learning interesting					
The administration in this school advocates for the use of ICT in teaching and learning					
School Administration has adequate ICT applications					

14. How can integration of information communication and technology be improved?

.....  
 .....



**Thank you for your participation**

**APPENDIX IV: INTERVIEW GUIDE FOR SUB COUNTY QUALITY**

**ASSURANCE AND STANDARDS OFFICERS**

1. How does the teachers' competency influence integration of ICT?
2. What are some of the competencies required in integration of ICT?
3. What are some of the ICT instructional materials required in integration of ICT
4. In what ways does ICT infrastructure influence integration of ICT?
5. What are the ICT infrastructure required in integration of ICT
6. How does the teachers' ICT training influence integration of ICT?
7. In what ways can integration of ICT be improved in Kinangop Sub-County?

## APPENDIX V: RESEARCH PERMIT

 <b>REPUBLIC OF KENYA</b>	 <b>NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY &amp; INNOVATION</b>
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<p><b>This is to Certify that Miss. HOTTENSIA WAMAITHA MWAURA of University of Nairobi, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Nyandarua on the topic: INFLUENCE OF SCHOOL-BASED FACTORS ON INTEGRATION OF INFORMATION COMMUNICATION AND TECHNOLOGY IN TEACHING AND LEARNING IN PUBLIC SECONDARY SCHOOLS IN KINANGOP SUB-COUNTY NYANDARUA COUNTY, KENYA. for the period ending : 07/November/2023.</b></p>	
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