

**INFORMATION COMMUNICATION TECHNOLOGY INFLUENCE ON
TEACHING AND LEARNING OUTCOMES IN KCSE IN PUBLIC SECONDARY
SCHOOLS IN KIAMBU COUNTY, KENYA**

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DECLARATION

I declare that this project is my original work and has not been presented in any other university/institution for consideration of any certification. Referenced sources that have been properly acknowledged have been used to support this research project. When text, data (including spoken words), graphics, photographs, or tables are taken from other sources, including the internet, they are properly acknowledged, and references are mentioned in accordance with anti-plagiarism laws and the current APA system.

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DEDICATION

I dedicate this project to my family for their spiritual and financial support during my education course whose values has enabled me to make great achievements. I am forever grateful.

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ABBREVIATIONS AND ACRONYMS

ICT	:	Information and Communication Technology
MDGs	:	Millennium Development Goals
NEPAD	:	New Partnership for Africa's Development
PBA	:	Performance Based Assessment
UNESCO	:	United Nations Scientific and Cultural Organization.

ABSTRACT

The aim of the study was to determine information and communication technology influence on teaching and learning outcomes in Kenya Certificate of Secondary Education in public secondary schools in Githunguri Sub-County, Kiambu County. The goals of the survey were: to explore the impact of adequate ICT resources on learning outcomes; to investigate the impact that ICT use has on the outputs of education; to determine the difficulties associated with the utilization of ICT in teaching and learning outcomes in Githunguri Sub County and to investigate the impact that students' and teachers' attitudes toward the utilization of ICT facilities have on those outcomes. The theory of cognitive flexibility served as the foundation for the study, which places an emphasis on the four levels of evaluation; reaction, learning, transfer, and outcomes. The survey embraced descriptive research design. 34 public secondary schools in Githunguri sub-county were the focus of the study. A total of 34 principals and 34 computer studies teachers and 2851 form three and form four students were targeted. Simple random sampling technique was utilized to choose 10 schools. A total of 285 learners were chosen from the sampled schools. The observation schedule and questionnaire were utilized to gather data. The pilot study was conducted in one public secondary school which was not included in final data gathering. The gathered data were analyzed descriptively with the aid of statistical package for social science (SPSS version 26) software. The analyzed data were presented through tables using percentages and frequencies. The outcomes of the survey revealed that the majority of schools had computers, scanners, and DVD/CD players. The study's findings showed that 64.7% of public secondary schools lacked enough ICT infrastructure, particularly computer labs and that even those that did have some were insufficient for proper integration of ICT in instruction. The schools should be provided the ICT tools such as laboratories, projectors, computers and printers in order to facilitate better utilization of ICT in teaching and learning. Through the ministry of education, the government ought to increase funding for ICT projects in schools, construct more classroom space, and provide these establishments with additional ICT resources.

CHAPTER ONE

INTRODUCTION AND CONTEXTUALIZATION OF THE STUDY

1.0 Introduction

The study's background, problem statement, purpose of the objectives, and research questions are discussed in this section. This chapter also provides operational definitions of terms, limitations, delimitations, assumptions, the theoretical and conceptual framework, and the significance of the study.

1.1 Background to the Study

Modern computing is made possible by the infrastructure and parts of information and communication technology (ICT). It is advising that all gadgets, adjusted parts, programs, systems, and applications be combined to allow individuals and relationships to function as partners in the cutting-edge environment (Rouse, 2019). ICT, according to the World Bank (2013), is a set of procedures for electronically managing, exchanging, and displaying data. ICT refers to the development of computer-based data sharing, transmission, storage, and dissemination, as stressed by the United Nations (2011). ICT is defined in this study as a collection of tools that can be utilized to organize, enhance, and control access to data and communication services. Devices and software like Internet, phone and mobile, radio, and TV are examples of the elements and services that are involved in ICT. According to Bakkabulindi (2012), there are two main categories of ICT. ICT utilized for information and data communication from one end, such as messages, telephones, and computer networks, as well as ICT that transforms or manipulates information into data.

Information and Communications Technologies (ICTs) have evolved into the fundamental component of the modern industrial civilization. Today, many nations place a high value on mastering information technology and comprehending the fundamental concepts and abilities related to ICT (Rampersad, 2011). The utilization of ICT in classroom instruction has been expanding at an incredible rate. Students can prepare for life in the 21st century with the assistance of ICT. According to Binimlas (2015), students who master ICT skills are prepared to face challenges in the future with the appropriate knowledge. Cocking (2000) says that using ICT can help learners learn the skills they need to deal with globalization right now. This is done so that students can use ICT to expand their knowledge, increase their motivation, and improve their skills (Waechaure, 2011).

Additionally, the usage of ICT has grown to be a crucial component of both the classroom and extracurricular learning for students. Without a doubt, a comprehensive force that goes beyond school dynamics is behind the utilization of ICT in schools and learning organizations (Voogt, 2013). Also, ICT, particularly computer and network innovation, provides improved methods of learning and teaching rather than allowing teachers and students to continue doing so in a traditional manner. The ICT has a noteworthy impact not only on what learners ought to know but also on how they ought to study.

ICT usage in the classroom is crucial in this computerized era to give pupils the chance to study and employ 21st century skills. It encourages teaching and learning and is crucial for directing teachers' efforts in their capacity as designers of educational environments. ICT can assist teachers in presenting the course material to their students in a fun and understandable manner at various training course levels (Ratheeswari, 2018). In reality, ICT has quickly evolved into one of the fundamental pillars of contemporary society. ICT

specifically has an impact on the teaching profession, and there is no denying that ICT has an impact on learning, teaching, and even research (Noor-Ul-Amin, 2013). In this way, ICT has been adopted, incorporated into education, and all nations today place a high value on mastering fundamental ICT concepts and skills through reading, writing, and arithmetic (UNESCO, 2012).

ICT has therefore improved learning results. The capacity and nature of these development appear to be misrepresented in a survey of the correlation between ICT and the implementation of secondary education. They undoubtedly require something that satisfies the needs communicated through the use of communication, adapts to individual conditions, and adheres to the limitations given that ICT is a well-known cause of this growing innovation period (Antonelli, 2013; Ben Youssef, 2016). Extended opportunities for burning techniques that are impartially close and in space are brought forth by ICT. It provides fresh strategies for kicking off secondary education. ICT is often seen as a force for advancement that can have an impact on every aspect of society (Lawrence, 2015). The usage of ICT has expanded to include changes to work environments, commerce, entertainment, data management, data exchange, education, teaching strategies, learning strategies, logical inquiry, and information gathering (Ratheeswari, 2018). Time has proven that civilization depends on ICT to enable it construct itself and get information (Hernandez, 2017).

The ICT is widely used to teach, address, and promote significant and legitimate topics, like wellbeing. ICT has also enhanced widely used, basic educational techniques. Over the past 20 years, numerous partners in government and education have generously funded the implementation of ICT in instructional frameworks (Lawrence, 2015). In reality, the

promise of ICT for education in schools and society is unquestionably to increase climate change's flexibility and versatility. Approaching quality orientation without addressing ICT use is, therefore, obviously problematic because of ICTs' excellent ability to integrate into the world, which is considered one of the market segments or pillars where quality education prepared for everyone can undoubtedly become a reality, even in the most remote and disadvantaged of communities.

In addition, advances in ICT are mainly felt through the development they bring to the teaching framework. Current progress in technology provides freedom for school education, such as access to courses, exercises, network preparation, computerized testing, and this is just the beginning (Berzan, 2017). ICTs also affect educational programs because they focus on the ability to gather and communicate information, and objectively organize courses and course manuals that can be modified according to students' needs (Deshmukh, 2013). Alternatively, ICT devices can be used to enhance the productivity and feasibility of observational and assessment teaching and learning. It is generally accepted that the innovative use of ICT interaction can improve progress in the way teaching and learning are managed by going beyond classroom teachers' lectures (Mahmud & Ismail 2014; Parvin 2013). Teachers use ICT equipment to collect and research information, while school principals use ICT equipment for authoritative purposes to ensure that all activities are conducted easily, such as quickly grasping the details of the individual learners (Deshmukh, 2013).

The influence of ICTs on the benefits of education and learning is reflected in accessibility and ability of educators to use the ICT facilities. For example, academic results, use students' application skills and computer information in the work environment

for activities. Chirwa (2018) points out that computers and networks are used to expand the basic skills and teacher business authority, provide skills that can then be used in class and help teachers invent knowledge of explicit educational methods. Li, Yamaguchi, and Takada (2018) also observed that ICTs should get the benefits of tutoring and help more effective teaching technology, providing students with data and improve communication that promotes learning. Furthermore, since ICT become increasingly inevitable, ICT teams form all the parts of educational operations, which influence students' achievement.

Furthermore, the ICT usage in education and learning can help learners to acquire competencies (Tarimo & Kavishe 2017). Despite attempts to utilization of ICT to enhance learning, the rise of the data economy has also brought more important supplements to teaching (Wong, 2013). For example, ICT can accelerate, enhance, and expand capabilities, facilitate and interact with students, help link school experiences with work practices, and create financial sensitivity for professionals about to be trained, similar to how to maintain teaching standards and support school reforms (Onwuagboke, Singh & Fokker, 2015). In a swiftly evolving world, critical basic education preparation is critical for a person to be enabled to access and put on information. Lai and Pratt (2014) advocate the widespread use of Performance-Based Assessment (PBA) in the transmission and evaluation of computer research and education programs, because they meet both information and evaluation needs. Unlike other assessment techniques, PBA provides many opportunities for students to demonstrate their ability to apply ICT in solving provable problems, and enables them to effectively perform fruitful learning exercises, such as searching for data, in the main classroom, try various methodologies and work as a team.

In developed nations for example, United Kingdom, schools have implemented the utilization of ICT in teaching and learning in their education plans, and demonstrated an undeniable strong and appropriate level of ICT use to help learning and teaching in all sectors of learning knowledge (Organization for Economic Cooperation and Development, 2012). In addition, UNESCO (2012) emphasizes that developed countries are integrating ICT into their school framework. This is, for example, to enable educators and students to create diverse, and intelligent conditions with almost unlimited teaching and learning potential. In addition, teachers in developed countries are using ICT in all aspects of classroom life to enhance learning for themselves and their learners (Davis, 2013). They utilize ICT to assist learners evaluate their learning to complete a particular personal project. Teachers often work with multiple partners to share experiences to solve problems, and therefore ICT is transformed into an incentive, for new teaching and learning opportunities (UNESCO, 2012).

Swedish School Improvement Agency (2008) demonstrate that when ICT is transformed into an integrated part of classroom and teaching, it provides constructive results in terms of learning and academic performance. Likewise, Gaikwad and Tankhiwale (2014) insist on that the availability of progressive visual development (such as images and animations in circulation) incorporates students and supports their conceptual thinking. Furthermore, the utilization of ICT in learning and teaching can evolve from a teaching model to a stakeholder, in which students participate, take their own decisions and are actively involved in learning (Swedish School Improvement Agency, 2008).

Therefore, for learners and teachers to use and create ICT resources that are integrated with learning and teaching, they must be in an environment that allows them to exhibit a high degree of intellectual flexibility. This makes transfer of learning more prominent. Learning transfer refers to performance in one situation, such as visual and auditory exercise, and the degree to which it reflects in another situation like working in a particular job (Allessi & Trollip, 2011). Therefore, teaching is a precedent for the practical application or utilization of ICT information for students in the classroom (Opira, 2012).

The research conducted in various settings also supported the impact of ICT on educational and learning outcomes. These surveys have found that ICT has a noteworthy impact on academic achievement and retention of learners. For instance, when ICTs are set apart from traditional teaching methods, individuals discover that ICTs are highly persuasive, strong, and essential to illustrate science (Hussain, Suleman, Din & Shaff, 2017). Additionally, the findings of Arahari and Singh (2013) are trustworthy in demonstrating that ICT has a favorable effect on the performance of secondary-level scientific learners. In a similar way, Ziden (2011) discovered that ICT integration into teaching and learning raises student achievement in scientific topics. Additionally, Higgins (2003) thinks that ICT has a favorable impact on learner achievement. Additionally, Alkamel and Chouthaiwale (2018) concluded that individuals obtaining training through traditional educational systems were contrasted with students receiving instruction using ICT. Despite the fact that these assessments distinguish between the positive effects of ICT and ICT benefits in student performance, they do not fully explore

the relationship between technology kinds and student ICT abilities, attitudes, and resources.

African countries on the other hand live with technological insufficiency, that is the lack of accessibility to the data learned through the Internet (Noor-Ul-Amin, 2013). Many African nations have invested a lot of time in the basic framework of ICT for the execution of basic vital opportunities for ICT in the provision of services, as well as teaching and learning (Zakaria & Khalid, 2016). ICT policies have been advanced in order to align with the global ICT teaching strategy (Agbo, 2015).

For example, in schools in Cameroon, the introduction of software engineering as a subject emphasized the preparation of learners and teachers on the utilization of innovative information to equip students with ICT skills (Kennah, 2016). ICT is considered to be an indispensable asset of Cameroon, which can help increase efficiency, intensity, promote development, open doors to work, and thereby promote prosperity for Cameroonians (Haji, Moluayonge & Park, 2017). Governments and training associations also seem to understand the significant of ICT presentations in school training and planning. For example, in order to improve and easily advance the ICT sector, Uganda's public experts addressed the challenges of the system and developed an ICT strategic structure in 2003 to strengthen its secret perspectives and possibilities. Therefore, from around 2006, the Ugandan government established an extensive Ministry of ICT to increase the significance of ICT in the transformation of events and the improvement of monetary policy.

Kenya's Financial Plan 2030 is concentrated on developing a Financial Plan that would give pupils access to up-to-date ICT information. More significantly, the 2005 Kenya

Session Paper No. 1 highlights the critical role that ICT skills play in a country's budgetary expansion (Mulwa, Kiilu & Musau, 2012). Therefore, according to the government, Kenya's entry into the knowledge economy depends on its workforce having an ICT education. As a result, the government has used education to give the nation the ICT skills it needs to achieve dynamic and manageable economic growth. After a lot of effort, Kenya became an ICT country in January 2006 with the goal of enhancing Kenyans' productivity by assuring the availability of transparent, efficient, dependable, and affordable ICT management departments. Public consensus can be found in a number of sectors, including data innovation, broadcasting, media communications, and email management. However, schools, universities, and other organizations all over the nation have established ICT-related goals and practices to improve the nature of education and learning as part of data innovation. Additionally, the country must accomplish some of the Millennium Development Goals (MDGs).

The output of ICT on learning and teaching effectiveness was further underlined in the Policy Paper No. 1 of 2005. This policy made note of the numerous benefits that ICT may bring to the classroom, general education, and preparation strategies. The use of ICT will open up new possibilities for teaching and learning, comprising chances for a more student-centered approach to instruction, chances for teachers and students to collaborate and communicate with one another, and different developments that offer more chances for variety in ICT use expedited by the teachers, increasing students' enthusiasm for learning to an even higher level. ICT use will also open up opportunities for a wider range of course options.

There are certain challenges with employing ICT in learning and teaching, despite the fact that its impact on improving performance and learning is evident. For instance, a recent study demonstrates that many instructors are proficient and confident in using computers in the classroom, but they have not made significant progress because of a lack of time. Several studies have shown that teachers have difficulties while utilizing ICT in the classroom because of time restrictions and the complexity of giving enough computer time to classes (Alwani & Soomro, 2012). The time needed to develop creative exercises, investigate many websites, and look up various components of the teaching method program are the most well-known challenges mentioned by all teachers.

The ICT give instructive institutions and other administrations the chance to apply innovation to strengthen and assist the educational system. When Kenya established the National Information and Communications Technology Policy in January 2006, its vision was to create a prosperous Kenyan culture powered by ICT, and its primary objective was to ensure the provision of open ICT, reliable, skilled, and affordable ICT services to improve Kenyans' quality of life (ICT Policy, 2006). The National Information Technology Policy section describes the destinations and methods connected to ICT and education. Public experts will specifically encourage the use of ICT in schools, colleges, and other coordinating relationships around the country in order to make progress on preparation. The primary goal of ICT in education is to improve teaching and learning, address problems, and produce new knowledge by being able to access, evaluate, and utilize information from many sources.

According to O'Conner and Polin (2011), a growing body of research, ICT may deliver a novel type of information for instruction and update teachers' and students' knowledge and

learning experiences. A thorough investigation of the use of ICT in academic achievement has been strongly recommended due to the increased focus on the more exploratory effects of ICT on learning and practice display (Opira, 2012).

ICT integration in education is critical because innovation enables educating and learning to happen in the classroom as well as when educators and students are truly isolated. However, ICT integration is not a one-time educational experience; rather, it is a course of progressing learning that creates a proactive instructing picking up setting. Educating and growing experiences in optional schools face a variety of challenges. For example, traditional teaching methods have been and are still utilized in Githunguri, where the researcher is a teacher, and their limitations in various situations rely on the demands of students and teachers. Embracing educational innovation in teaching and learning is not given much attention, but if used properly, ICT can be an invaluable tool for transforming the teacher-centered, text-heavy classroom of today into a rich, learning-oriented classroom and learner-centered intuitive informative environment.

In the Sub-County of Githunguri, there seems to be general knowledge about changes in existing technology in the industrial sector, but the use of computers in public secondary schools seems to be inadequate (Republic of Kenya, 2016). The utilization of computers in education and learning is limited to some public secondary schools. This study intended to determine the influence of ICT on education and learning outcomes in public schools in the Githunguri Sub-County.

1.2 Statement of the Problem

ICT is used to help teachers educate more effectively and improve students' conceptual comprehension, which leads to good performance. As a result, when ICT is applied, learning becomes engaging and appealing, and students become more competent and relevant, leading to good performance. The academic performance of students is anticipated to increase with the inclusion of ICT. Ngugi, Kiboss, and Tanui (2015), on the other hand, discovered that despite the fact that secondary school educators have been incorporating ICT into their instruction, learners' scholarly accomplishment has not fundamentally advanced to the next level. Despite the fact that reviews have been conducted to assess the effect of ICT in various Kenyan schools, particularly in Githunguri Sub-county, there is a lack of data on what the incorporation of ICT in educating and learning means for learners' outcomes in public secondary.

Despite the excitement surrounding ICT-supported teaching and learning in secondary schools, the real challenge for public secondary schools is how to alter the conventional teaching cycle and equip students with the skills they need to function appropriately in this specific, data-rich, constantly changing environment. Failure to adopt ICT, Kenya fulfilling Vision 2030 is a challenge since the ICT reduce illiteracy by providing educational opportunities, improving transition rates and increasing the quality and relevance of education in the increasingly ICT dependent world of work. ICT adoption primarily increases students' lifelong learning and improves their knowledge abilities by encouraging them to explore and discover rather than simply learn and recall. The current study therefore sought to determine the ICT influence on teaching and learning outcomes in KCSE in public secondary schools in Kiambu County, Kenya.

1.3 Purpose of the Study

The purpose of the study was to assess the information communication technology influence on teaching and learning outcomes in KCSE in public secondary schools in Githunguri Sub-County, Kiambu County, Kenya.

1.4 Objective of the Study

The study objectives were;

- i. To determine the influence of availability and adequacy of ICT facilities on teaching and learning outputs in Githunguri Sub-County.
- ii. To examine the influence of utilization of ICT on teaching and learning outputs in Githunguri Sub-County.
- iii. To assess the influence of learners' and teachers' attitude towards ICT tools utilization on teaching and learning outputs in Githunguri Sub County.
- iv. To assess the challenges facing the use of ICT in teaching and learning outputs in Githunguri Sub County.

1.5 Research Questions

The study sought to answer the following questions;

- i. What is the influence of availability and adequacy of ICT tools on teaching and learning outputs in Githunguri Sub County?
- ii. What is the influence of ICT utilization on teaching and learning outputs in Githunguri Sub County?
- iii. What is the influence of learners' and teachers' attitude towards ICT tools utilization on teaching and learning outputs in Githunguri Sub County?
- iv. What are the challenges facing the use of ICT in teaching and learning outputs in Githunguri Sub County?

1.6 Significance of the Study

The research is greatly beneficial to course developers and stakeholders in the Kenya and beyond one by one as follows:

- i. The results of this survey will be significance to MOEST and TSC in reviewing policies in regard to teaching practices to enhance effective learning and teaching environment. This will provide a reference for future plans to eliminate the deficiencies that have been discovered so that all schools in Kenya will be compliant with ICT requirements.
- ii. This research will also demonstrate the influence of ICT in schools, thus will encourage other schools that have not yet fully implemented ICT, so that all schools shall benefit from ICT teaching.

- iii. This research will also be important in identifying the challenges schools face in the use of ICT in teaching and learning then propose mitigation measures to address these challenges.
- iv. The Kenya Institute of Curriculum Development (KICD) will utilize the outcomes in designing teaching courses for the teachers that will be essential in implementing quality of education to the students.
- v. The findings will also be used as reference by other academicians who would be involved in conducting more survey in the same area or a related area of study. The investigator hopes that this research will be of use to future researchers who are interested in surveying the influence of ICT on learners learning.

1.7 Limitations and Delimitations of the Study

1.7.1 Limitations

- i. The survey faced potentiality of non-response error but the researcher made follow-ups to clarify on misinterpreted issues when they occur.
- ii. The problem of missing some of the participants where they were expected for the purpose of interviewing them that is, in the school but the researcher made a revisit to the place to collect the data.
- iii. Personal prejudices and emotional responses to queries that could produce misleading research findings. In order to address this issue, researcher first built a rapport with participants, enabling them to freely and truthfully respond to questions.

1.7.2 Delimitations

- i. The study involved selected participants from public secondary schools in Githunguri Sub-County. Thus, other areas that are not within Githunguri were not covered by the study.
- ii. The survey also dealt exclusively with adequacy of ICT tools, utilization of ICT, learners and teachers attitudes and thus other topics or issues were not covered by the study.

1.8 Assumptions of the Study

The exploration assumed that;

- i. The utilization of ICT affected learning and teaching outcomes.
- ii. The information provided by participants was true.
- iii. The data given by the participants was accurate and free from bias.
- iv. That the participants had adequate degree of knowledge on ICT

1.9 Theoretical and Conceptual Framework

This study relied on the theory of cognitive flexibility (Jones & Spiro, 1992), and highlighted in Kirkpatrick's model (Choi, Hong, Park & Lee, 2013). Kirkpatrick emphasized responses, learning, information transfer, and outcomes. The learning in the first level, which is called the reaction level, is an estimation of how the participating members will react to it. It tries to answer queries about the behavior and attitude of the members; do they like it? Is this material suitable for their work? Likewise, the reaction of the members has a great influence on learning (level 2), though a positive response does not assurance learning. Negative reactions are likely to reduce the chance of it happening.

At the second level, teaching is beyond students' satisfaction to showing the efforts of the students to overcome the sense of achievement, they try to evaluate the progress in skills, knowledge and attitudes so as to determine to what extent learning has occurred. The third level is about transfer; this level is adequate to communicate student's behavior as a result of the teaching process.

Cognitive flexibility means that you can instantly reconstruct and apply your information from multiple perspectives, which is a cross-functional response to rapidly changing contextual demands. Generally, the hypothesis is worried about the exchange of data and abilities past their underlying mastering climate. Abilities move can be portrayed as an understudy's longing to utilize the data and abilities dominated during the hands on readiness course (Choi, Hong, Park & Lee, 2013). For students who have mastered the materials provided in preparation and apply new information or skills to work practice, their academic achievements will change positively. Two different forms of transfer have been suggested; close-up transfer and long-distance transfer. The close up or near transfer is about applying the acquired information or capabilities to another environment very similar to the first one. Teachers should plan an ICT guide to show the steps that are frequently used in similar applications. The advantage of this is that the preparation of skills and materials is simpler, and learning transfer is actually a success.

The far-transfer is the ability to use information or skills acquired in completely different conditions (Clark & Mayer, 2016). To take a big step, teachers need to plan the direction of ICT so that students are willing to adapt the rules to changing situations and conditions. Therefore, students can make choices and adapt to different situations as they acquire skills and information. Overall, this is an ideal choice for the powerful ICT development

in today's world. It is significant to comprehend that all learners want to utilize the skills they have acquired in their work in order to achieve the required level of communication. However, this only applies to students who recognize the importance of competence for the required career orientation in the field. The fourth level is the result. In many cases, as the primary concern, this level has achieved plan completion; managers can see at a glance in terms they can understand-creativity is expanded, quality is improved, recurrence of unfortunate accidents is reduced, and enrollment rates are expanded.

Clark and Mayer (2016) noted, one of the reasons for inability to transfer is that occasional preparations are sometimes suited to communication and learning. In other words, cognitive learning is conceivable; however, project individuals might not have the chance to rehearse in task settings or they may not be helped how to utilize their insight at work. Along these lines, the real preparing will impact the exchange of abilities straightforwardly. In this study, Theory of Cognitive Flexibility clarifies the influence of ICT on learning and teaching outputs as well as the benefits that pass from the reaction phase, learning measures, transfer and results (learning outputs).

Teachers need to instruct students to understand that the exercises they are trying to do can help them better understand their concerns. By looking at the basic errands given and applying the procedures of your choice, the student becomes a master student who understands how to study everything on their own. The theory of intellectual flexibility helps in ICT utilization in education and learning to redesign and apply data at each of the four levels (response, learning, movement, and outcome) and then focus learning. Follow this review for students and schools working to implement.

The students conduct their own data searches and practice what they have learned using ICT resources. Students may control the ICT assets, and by doing so, they are less likely to forget what they have learned. Students will learn knowledge more quickly, and their academic performance will increase.

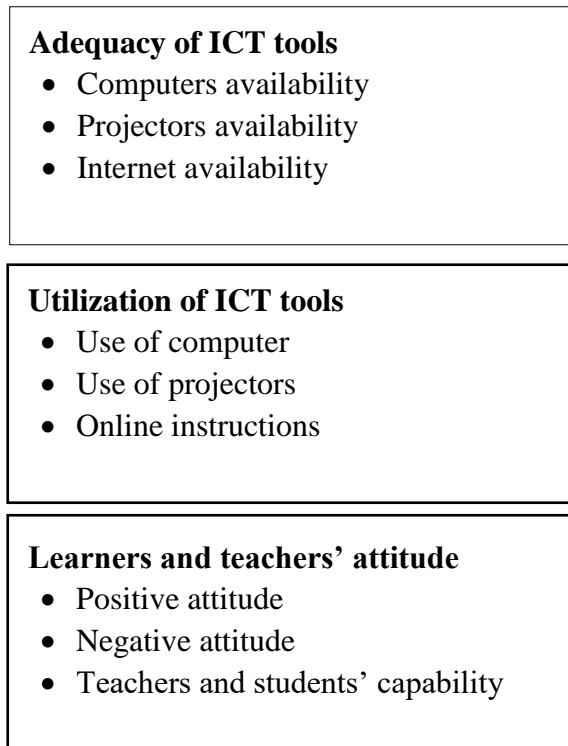
1.10 Conceptual Framework of the Study

The conceptual framework shows the interrelationship between the three variables which are independent variable, intervening and dependent variable. Independent variables comprise of adequacy of ICT tools, utilization of ICT tools, and learners and teachers' attitudes. The intervening variables comprise of teaching methods, availability of other learning tools, teachers and students' level of intelligence, government policy and ICT policies. Moreover, the dependent variable involves learning and teaching outputs which is characterized by improved teaching, improved academic performance, knowledge gained and termly assessment test.

For the utilization of ICT in secondary schools, principals, teachers and learners need to have knowledge on ICT. This knowledge will spread depending on learners and teachers' attitudes, adequacy of ICT tools, and utilization of ICT tools. The adequacy of ICT tools, such as computer labs, internet connection, computers, overhead projectors and power are prerequisite for ICT utilization in teaching and learning. The interaction of teachers, students, and administrators with technology affects how well students perform academically.

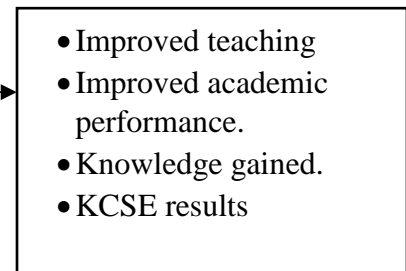
INDEPENDENT VARIABLES

ICT Tools



DEPENDENT VARIABLE

Learning and Teaching Outcomes



- ✓ Teaching methods
- ✓ Availability of other learning tools e.g. text books
- ✓ Teachers and students' level of intelligence
- ✓ Government policy
- ✓ ICT policies

Intervening Variables

Figure 1.1 Conceptual Framework
Source: Researcher (2021)

1.11 Operational Definition of Terms

Attitude:	This implies the way that one thinks and feels about something
Computer:	A broadly useful gadget that can be customized to do a bunch of number crunching or legitimate activities naturally.
ICT Integration:	The consistent incorporation of Information communication and Technology to help and upgrade the fulfillment of educational program goals, to improve the fitting abilities including expertise, information, perspectives and qualities.

Resources:	A stock of supply of money, materials, staff or assets that can be used by an organization to achieve its objectives.
Teaching:	To instruct, educate or train somebody (learners/pupil or student) in order to cause him or her to acquire desirable knowledge, skills, attitude, habits and value for present and future application in his or her life.
Information and Communication Technology (ICT):	Are technologies that enable information access through telecommunications
Learning outcomes:	These are quantifiable accomplishments that the learner will be able to understand once the learning is finished, which helps learners comprehend the relevance of the subject matter and what they will gain from taking part in the learning activity.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This section outlined the literature as per the study objectives. The literature focused on integration of ICT in teaching and learning and how it influences learning outcomes. The literature is based on adequacy of ICT tools, utilization of ICT tools, attitudes of teachers and students toward ICT and challenges facing the use of ICT in teachings and learning. Moreover, literature summaries and study gaps were also presented.

2.1 Adequacy of ICT Tools

Thiele, Mai, and Post (2014) studied on student-centered classrooms. The survey was conducted in United Kingdom. A cross-sectional research design was utilized in the survey. The study findings revealed that the various stages of learning and teaching

advancement in the twenty-first century are heavily reliant on the suitability of today's computers, peripherals, framework organization, and resources. ICT is committed to researching solutions to inadequate learning that will improve learning effectiveness. Adequate ICT resources can increase learning quality by lowering the number of incompetent teachers and allowing students to access tutorials from home all day (Thiele, Mai & Post, 2014).

According to Gaikwad and Tankhiwale (2014), ICT can successfully transmit information to learners. Additionally, having adequate ICT resources can help students take use of their considerable flexibility to find information for educational purposes and enhance learning through ICT (Riel, 2012).

Swedish National School Improvement Agency (2008) provides evidence that the use of ICT has improved student achievement when integrated into teaching and learning environments. According to Gaikwad and Tankhiwale (2014), students can integrate and support application trends because mechanized visual development in media like sports, entertainment, and movies is enough. The use of ICT can also shift from an instructor-focused approach to a student-focused model, enabling students to participate, settle on their own choices, and play an effective job in learning (Swedish National Council for Improvement, Schools, 2011).

Davis (2013) reviewed the utilization of innovation in teacher education in the United States. Correlational research strategy was employed in the investigation. Polls were utilized in the study to gather information. According to the study's findings, ICT tools are adequate for teachers to create assignments that are tailored to each student's needs and

preferences, which is especially beneficial for children suffering the devastating impacts of learning difficulties. Leask and Pachler (2013) hypothesized that utilization of computers by learners would prevent them from focusing on their core work. The survey elaborate that learners and teachers may have sufficient and beneficial access to computers. This is also a crucial factor for them to oversee regular evaluations, teamwork, instructing, and evaluating students (Riasati, Allahyar & Tan, 2012). The degree to which instructors and students accept that the devices will be sufficiently accessible in daily life and used on a regular basis to advance their advancement in academic work will depend on how much they believe in these services. This issue can be unmistakably perceived from the perspective of ICT use in education (Hani, 2014).

Here, it's important to note that although they make up a small portion of ICT departments, computers are nevertheless valued highly in educational settings. Instead of using them as assistants for typesetting and other exercises associated with word handling exercises, they should be provided the proper programming, valid affiliation with basic organization, and considerable access to obtain a lot of resources from outside of school. Although studies have frequently tried to define what ICT sufficiency implies for learning, they haven't looked at how certain ICT tools will undoubtedly affect student learning outcomes (Davis, 2013).

2.2 Utilization of ICT Tools

According to Hani's (2014) research in Jordan on the benefit and drawbacks of computer-assisted language learning and education, students must use ICT in classrooms. 250 students made up the study's sample. A cross-sectional survey design was embraced in this investigation. The use of multimedia and a plethora of educational resources via the

school's Internet is thus made possible by a large-scale cooperation that enables effective ICT integration in schools. This partnership includes both instructors and students from inside and outside the school. In order for students and faculty to effectively use the different disciplines offered at the school, the number of computers in the computer lab and classroom should be employed wisely. The curriculum includes a range of remote and auxiliary workstations, including video conferencing, which are offered and included in the work schedule. The huge and infrequently set up VDU workstations are immediately accessible under this work arrangement (Hani, 2014). Despite the aforementioned needs, most African institutions still encounter challenges in fully incorporating ICT into the teaching and learning process. Gaikwad and Tankhiwale (2014) sought to create a respectable research facility to a limited level and give students access to ICT resources after that.

Gaikwad and Tankhiwale (2014) conducted a study on interactive E-learning colleges in India. Explanatory research design was embraced in the survey. The survey's outcomes uncovered that different academic researchers that investigate instructional multimedia primarily concentrate on information accessibility and presentation. Finding an intuitive approach that can improve the information's presentation clarity and accessibility is, in any event, not difficult. The fundamental obstacle to learning is typically not that it is difficult to find accurate information or that it is poorly presented; rather, the issue is more specific to that topic (Baker & Schacter, 2011).

The utilization ICT tools enables students to have a more comprehensive understanding of this current real world (Leask, 2012). They can get to data sources quicker outside the study halls, and can use ICT instruments to check and decipher the data. Through internet-

based designs or information recording frameworks, data can be accessed (Riel, 2012). They can get feedback, refine their agreement, assemble fresh information, and transition from a classroom environment to one outside of it thanks to innovations in technology (Learning Science Development Committee, 2010). This used to be hard to do in schools because of the important goals and number of subjects to cover, but now it can be done by using ICT resources, which provide broad and deeper knowledge (Leask, 2012).

The barriers related to ICT convergence falls within the bodily realm, beyond the rapid control of instructors (Ham, Schnabel & Datta, 2012). These barriers revolve around adequacy and establishment, and are associated with purchasing decisions, cable placement space, and decisions about placing computers in a centralized laboratory versus computer units in the classroom. Assembling computers in the centralized laboratories can enable students to gain fair and successful advanced exposure to ICT, in addition to utilization of technology for the classroom teaching (Ham, Schnabel & Datta, 2012). The laboratory denies teachers the flexibility to choose when to utilize ICT in teaching, and can send information to learners that computers are not the key to classroom learning. Similarly, the real study of classroom obstacles, including the size and space of the work area, usually limits the classroom's arrangement choices and does not provide the necessary space for the addition of computer units used as future technology centers.

In 2012, the ICT program designers at Makerere University agree with the researcher that in general, the authorities and planning agencies seem to see the significance of having

ICT in education and preparation. The instructors and learners require reliable plans and have the current basic capability to deal with the ICT environment completely under different constraints (Makerere University ICT Policy, 2012), the ability to focus may be insufficient, but this will increase people's awareness of ICT resources due to the fairly consistent utilization. Continuously utilizing computers can make teachers feel happy about using ICT during a lesson and give them determination to try more, thereby, helping them organize and utilize ICT in lessons efficiently. In addition, various studies have shown that over time, as teachers and students continue to utilize ICT gadgets and continue to be more experienced in their preparations for work, the influence in learning will continue to improve (Swedish National School Improvement Association, 2008).

Dewey (2009) says that information that has been accessed but during the process has never been utilized, may be difficult to retrieve when needed under normal circumstances. Similar measures should be taken to ensure that targeted secondary school students make progress in actual utility of ICT and develop the habit of truly meeting their prerequisites. Although previous studies focused on the utilization of ICT resources based on learning, they did not investigate key information about access points such as libraries and laboratories. In addition, the influence of the utilization of ICT tools in Githunguri sub county, Kiambu County on school learning and teaching has never been studied.

Teaching is generally becoming a very challenging profession, this is because knowledge is developing rapidly, and a large part of it has been open to students in a likewise way to their teachers. The present development of advancement in technology provides more opportunities to teaching profession, but then has placed a lot of demand on the instructors

and learners who are now required to selectively utilize these new advancements in learning/teaching processes (Jung, 2011).

In relation to the above highlights, extensive changes have taken place around the world to inject ICT into education preparedness. A belated survey by the British Educational Technology and Communications Agency (BECTA) emphasized that utilization of ICT material is one of the five main pillars of the school's ICT integration portfolio (British National Curriculum and Assessment Board, 2014).

According to research by Ham, Schnabel, and Datta (2012), ICT use at any time can unquestionably enhance the learning cycle and outcomes. Their findings demonstrate that the utilization of ICT technologies effectively relied on the educational environment, the information content, and the teaching tactics plan. For efficiency integration of ICT in teaching and learning programs, learners and educators must feel confident in their subject knowledge and fundamental ICT competencies. Numerous studies have shown that when learners utilize ICTs to help them communicate their purposefully informed information, they are also more motivated to understand the components of ICT and their capabilities. As a result, they are more closely connected to and motivated to master using ICTs. It is inaccurate to assume that students will understand and be able to use tools and software if they can recall their components. Students don't develop the necessary review skills to finish carrying out different learning tasks. They repeatedly practice recall, and if the system is unsuccessful, they must resort to alternative approaches. This is especially disappointing for ICT because ICT's essential memory mechanism doesn't function (Chiu & Churchill, 2016). The researcher acknowledges that teachers' low expectations, which

downplay students' expectations and the entire educational system, are the most pervasive but subtle cause of the underperformance in the use of ICTs.

Laurillard (2016) proves, there is unrelenting disparity between the submission of questions asked for new technology studies evaluation and the process of their completion. When researching ICT and learning, Laurillard (2016) has shown time and time again that the utilization of ICT will determine any influence of ICT on scholarship, and it is quite challenging to distinguish the role of ICT on learning from the context of their use. Joy II and García (2008) support this, by suggesting that it's both the ICT utilization and specific teaching and learning practices in enhancing learners' performance that should be studied. The same point is emphasized by (Kennewell 2011).

In addition, students and teachers will become aware that, the utilization of ICT tools combined with particular teaching practices can enhance achievement in learning and students' improvement in their learning ability. In addition, students get more significant help, show extraordinary maintenance and are more roused to realize when they use computers all the more regularly (Richmond, 2014). Richmond adds that on the grounds that ICT use is totally incorporated in the overall learning framework, it is hard to disconnect the innovation factors and pick whether the noticed increases are an immediate aftereffect of the innovation usage or much different elements or mix of elements. Though, these studies distinguish the results and advantages of the ICT use, they have not exhaustively focused on the types of ICT, learners' abilities and the adequacy of ICT assets in learning outcomes.

2.3 Attitude Towards ICT use in Teaching and Learning

In this section, teachers and students' attitudes were discussed in subsection below;

2.3.1 Teachers' Attitude Towards the Use of ICT in Teaching and Learning

Jimoyiannis and Komis (2007) noted that attitude is the propensity to continuously respond favorably or negatively to a specific objective. According to a study in UK by Underwood (2016) on attitudes of teachers toward utilization of ICT in learning and teaching. The outcomes uncovered that that teachers are utilizing ICT to supplement current teaching strategies. The instructors have increased the utilization of ICT in education and learning notwithstanding how many have protected educational data (through improved access to ICT-based materials and extensive preparation and conversation in education). Results have been largely positive, according to Haggins (2015). As a result, if instructors wish to effectively employ innovation in their classrooms, they must have a favorable attitude toward technology.

ICT provides access to data to help educators try new strategies, think, consider practices, and use new materials (Learning Science Development Committee, 2010). There is no doubt that educators who utilize ICT in the classroom need to have basic levels of energy, difficult tasks, and safety (Churchill, 2016). In addition, various assessments have shown that teachers' sole access to ICT equipment with a clear goal of preparation and preparation has perhaps the most serious impact on achieving ICT preparation and the inevitable use of learning space. (Educational Standards Bureau, 2012). Bitner and Bitner (2012) accordingly maintain that active and visionary governments influence the spirit and practice of educators regarding the ICT utilization in the classroom. The inability of instructors to utilize ICT was a result of lack of knowledge and negative attitudes toward

ICT integration. Many teachers do not have an environment that is conducive to the ICT usage in teaching and learning (Ganesan & Krishnakumar, 2016).

2.3.2 Student's attitude towards the use of ICT in Teaching and Learning

A survey in USA by Bitner and Bitner (2012) on coordinating innovation in the classroom. A cross-sectional exploration program was used for verification. The survey was utilized to gather information. The review uncovered that the utilization of ICT in schools is significant in supporting learning and providing basic mechanical skills. In addition, ICT needs to expand the involvement and freedom of new students so that they are expected to make full use of ICT and adapt to changing work styles. Taking everything into account will further increase student excitement. i) Independently cautious, ii) compatible, community-oriented, iii) direction and negotiation. The research above focuses on showing that freshmen see a more observable commitment to their insights when using ICT devices and show that it is a much more autonomous and appropriate job. The revelation shows that ICT education needs to be encouraged among new students.

The limitations of ICT can be taught outside of the classroom, at home, and in informal groups with peers, according to Eurydice (2015). The learners' informal learning while utilizing ICT meetings underline how much more alluring they are than what schools can provide. Similar issues arise when undergraduates use ICT in the classroom. According to Rockman and Chessler (2013) learners' computer knowledge affects both their academic achievement and their access to engaging learning opportunities. This study is focused on offering more proof that using ICT for learning increases student engagement. In any

case, two or three sub-students can be disappointed when they find that ICT limits are underestimated and underutilized (Bitner & Bitner, 2012). In addition, they rely on teachers to utilize ICT resources to teach and adapt the goals of our ICT mix in an acceptable way. Nordic (2010) takes e-learning into account, as well as ICT on so-called options or delay factors such as inspiration, fixation, commitment, intellectual cycle, ingenuity, basic thinking, autonomous learning, and investment. Putting certain features of the constructive achievements of the cooperation. Comber (2012) and Higgins (2015) shows that extended inspiration limits positive learning and leads, for example, to more consideration of examples where students are busy with learning exercises.

Facilitating student collaboration becomes more crucial when students use ICT for tasks (Kezzel, 2015). The aforementioned confirms that ICT supports an approach that is fundamentally advantageous to pupils and is centered on extra research into learning. They discovered that two other significant effects of ICT in the classroom were increased appropriateness and learning contributions. It also encourages new students to reflect on what they have learnt and how they have learned it. Romboll (2016) acknowledges that using ICT helps children with exceptional requirements and social difficulties develop somewhat diverse tendencies. Students' propensity to utilize ICT devices, for instance, may increase with proper ICT device use for learning.

2.4 Challenges Facing the use of ICT in Teaching and Learning

The study addressed the following potential challenges which hinder the utilization of ICT in teaching and learning.

2.4.1 Teachers Training in ICT use in Teaching and Learning

As stated by Bitner and Bitner (2012), the topic of ICT preparation is really impressive considering how to integrate several parts to ensure proper preparation. Lack of educator preparedness to meet the boundaries of ICT is one of the major obstacles encountered in providing ICT education in schools. Pelgrum (2015) considered that inadequate teacher preparation for the ICT usage devices in the classroom was one of the key issues for facilitating ICT integration in schools.

In Uganda, review by Mbulankende (2017) on the assessment of ICT readiness by teachers at specific universities. This review, like most developments, found that ICT would not work without significant support. The review recommended that consistent preparation should provide a means for teachers to keep up-to-date with ICT and its educational and learning applications in order to further develop educational boundaries. In all subjects, faculty members are aware of, well-prepared, and well-prepared for the most skilled methods of using various ICT devices commonly found in classrooms such as projectors, personal computers, electronic whiteboards, and advanced cameras. The Department of Basic Education needs to implement appropriate systems to ensure that the ICT usage in education and learning involves the recruitment, preparation and retention of staff.

Krysa (2008) uncovered that ICT preparation ought not be limited to all software engineering teachers, not just those who offer software engineering courses. The point of ICT preparation is clarified by the fact that most teachers have recently begun traditional preparations and there is little preparation for using a computer in the classroom. The researcher also impressed that trainer information needs to be updated in the area of rapid

progress in communications innovation. Instructors must first become familiar with how to use a computer before incorporating it into the curriculum. This may facilitate the procurement and implementation of ICT development by enabling current customer-focused developments (Teare, 2010).

In their study, Malcolm and Godwyl (2011) found that the retreat of professional improvement programs for educators to refresh their skills with new innovations is an obstacle to ICT practice. Poor skill and the need for trainer preparation affected ICT practice. ICT skills are needed to build, add and present promising situations through new advances. Talents need to be created through preparation, research, and appropriate restriction settings.

Another research by Bauer and Kenton (2015) uses ICT assets as both educational and learning tools, noting that instructors have acceptable limits, are creative, and are viable and deterrent. Outdated reasons, lack of programming, special professional assignments, student skills. Concentrators also found that tremendous progress among experts is affecting the spread of ICT in the laboratory.

2.4.2 Administrative support of ICT in schools

Enactus, Lwoga, and Sanga (2015) noted that teachers have no direct control over physical barriers to ICT integration that are outside of their immediate control. These obstacles center on infrastructure and accessibility and include choices regarding purchases, where wiring drops should be placed, and whether to deploy computers in classroom computer pods as opposed to centralized labs.

Priscilla (2011) asserts that the purpose of regulatory support is to facilitate the preparation for and participation of ICT-equipped computers in the curriculum offered by the school. It refers to the guidelines and assistance that the heads of the major advisory foundations provide: the capacity to utilization of ICT in the classroom effectively. ICT-based administrative assistance is insufficient despite the teacher's enthusiastic interest in cooperative activities and teaching methods. When teachers have strong support from school administration, they use computers more frequently for teaching and learning activities.

Kariuki (2013) says that educators who receive appropriate ICT support from their organizations will definitely use ICT in demonstration practice, but educators who do not receive ICT support from school supervisors will use computer. School supervisors, like managers, act as mediators for incorporating ICT into the educational framework and are key to enabling, supporting and using computers by educators in counseling interactions. Sife (2015) argued that one issue that prevented instructors from following their rules for using computers in the classroom was the absence of financial, administrative, and special support. As a result, the school organization's activities are crucial for supporting, influencing, and weighing down the usage of computers in empirical learning processes. The acceptability of ICT in the educational system is significantly influenced by management support.

In order for ICT reception to be outstanding and realistic, according to Sife (2015), top-notch professional managers of innovation should start from the ground up. Administrators must quickly adopt new ideas, especially when it comes to organizing ICT

in the classroom (Tusubira & Mulira, 2014). Priscilla (2013) reaffirmed that the key to bolstering requests for electronic practice materials that improve the use of ICT on certain issues in guideline delivery is leadership from the top of the office. According to the evaluation, the school director's assistance was necessary for the integration of ICT into the pedagogical framework.

A study at Curtin University of Technology by Yang (2011), found that teachers with the help of school principals have a high commitment to using ICT for education and learning. The information in this assessment recommended that ICT use in classrooms and reception areas should be improved, starting with ICT support units that are distributed throughout the Foundation's association level. A basic theme added to the overhaul of the ICT movement is a basic ICT working environment sufficient to measure the abundance of well-working ICT devices accessible to students and trainers for educational and learning purposes. On the other hand, it is not only a simple measure of researchers, but also sufficient for access to security, as well as for the use of educational and explicit support (Nachmias, Myioduser, Cohen, Tubin, & Bifunestbarch, 2014). Aryatura (2012) stated that in order to accept ICT meaningfully, sufficient PC equipment and programming must be closely linked to the well-prepared educators and the constant professional support.

2.4.3 ICT Policy in Education

Heeks (2010) conducted a study on the ICT strategy of non-industrialized countries and found that in the Kenyan curriculum, decision makers apparently lack the energy to engage in ICT projects. Governments in developing countries invest little in technology in

corporate-wide coordination policies, business creation and technology development between the private and public sectors. Therefore, the lack of a political focus will affect the implementation of educational objectives.

Hawkins (2012) noted that although many training services around the world have made computerization mandatory in schools, few institutions have put in place a decent system to fully coordinate the use of IT tools in academia or in classrooms. It is necessary to broaden and guide the bases for the construction of the ICT methodology in order to consolidate the setting of goals and the utilization of ICT tools to achieve those goals and provide a structure that supports the development of ICT in the organization to support and plan use the maximum capacity to use ICT as support in all aspects of education and learning (Chisenga, 2010).

Odera (2011) provides an overview of the informatics education policy for secondary schools in Kenya and its implementation. The survey discovered that 76% of the majority of school principals have organized the application of computers in learning, but currently 24% of school principals are planning computer-based instructional strategies. The survey suggests that all educators, learners, and those in the school location should be trained and the importance of implementation should be made understandable. Consequently, numerous policy statements are written documents and others are undocumented for distribution to schools, but are still included in current teaching methods.

Kindiki (2008) believes that the school's curriculum management relied on the way the teachers and education managers allocate time as the basis for the construction of the entire school. Kenya has made extraordinary progress in declaring the ICT strategic

structure and execution strategy, and has provided quantifiable outputs and time frames. It must be passed on to every school to successfully implement ICT utilization in education and training.

2.4.4 Funding for ICT investment in Education

In Kenya, a survey by Murithii (2017) on factors impacting the execution of ICT training in open grade schools. This review utilized an illustrative study plan. The review was utilized to gather information. The outcomes showed that the best test for utilizing ICT in the study hall could be to offset homeroom objectives with real monetary elements. According to a Wood (2013) survey, above 40% of Africa's population lives in areas not concealed by telecommunications services. This signify that basic requirements (such as good roads and power supply) cannot be met. ICT classes are not available if the school does not have the power to control the computer. Locations where power is available are often interrupted by power outages, so you should temporarily suspend running computer time. Power outages have been a long-standing problem and have been an obstacle to ICT education in schools.

Aryatuha (2012) pointed out in his study that the usefulness and programming of computer equipment needs to be done through user training and ongoing hands-on support. Without it, customers may have access to good devices and programs, but they may be wasted or underutilized. This may explain why ICT is so easy to implement in public schools. Nachmis (2014) found that the utilization of framework is a critical variable in driving advancement. This remembers gear, for example, the quantity of computers for the school that understudies and instructors can use for instructive purposes, hardware quality and how it works, and the accessibility and openness of

computers apparatuses. Nonetheless, the utilization of data and correspondence innovation alone isn't adequate and should be joined by specialized and proficient logical help.

A review by Grace (2012) on factors impacting the reconciliation of ICT into study halls: at elective schools in Nairobi County, Westlands Campus, Kenya. The audit observed that administration offices give educators who request the utilization of ICT gadgets and the ampleness of ICT assets. Regardless, support for ICT systems isn't yet practical. In this way, the absence of an appropriate establishment emphatically affects the execution of the ICT, contingent upon how it is utilized. Accomplices should know that this data should be utilized to adequately embrace ICT in schools. Many schools in the Githunguri area have ICT infrastructure. Some schools have classrooms that are not comfortable and have some restrictions. The current circumstance has progressed from a desperate to a more pitiful one since the Government of Kenya implemented Free Basic Education (FPE) in 2002 (Somerset, 2011). The number of students has grown from 5.9 million to over 8.6 million since FPE was first introduced. There is generally no equivalent extension to an overloaded education system to justify the huge integration of students. Less attention is paid to room area, work area, number of teachers and other assets (UNESCO, 2012). In some schools, more than 80,100 students are currently in class and the ratio of regular teachers is currently 60:1 (Oketch & Rolleston, 2014).

2.5 Summary of Gaps in Literature

Based on a review of literature collected by several researchers and former analysts from secondary sources such as course-books, magazines, the Internet, and newspapers, there are several variables that affect the ICT implementation in public schools. The infrastructure is probably the biggest test of ICT use in schools because it balances

educational goals with real financial factors. In improving ICT usage skills and management support, most researchers and previous studies have found that these two factors generally have a positive impact on ICT implementation.

There are several researches on infrastructure, teacher preparation, ICT school policies, and management support related to the adoption of ICT in secondary schools, according to the literature. ICT's impact on secondary school education and learning outcomes in the Githunguri Sub-county, however, cannot be logically explained by the specific requirements, restrictions, and obligations of the aforementioned research. Secondary education cannot be economically solved by using ICT, but it is crucial for the education sector to upkeep the creation of innovative teaching and learning strategies and the availability of educational materials.

The utilization of information and communication technology (ICT) tools in the classroom is not yet strongly encouraged, despite several studies demonstrating that ICT use improves general education and learning. This study's main finding is that junior high school students who employ ICT-based learning outperform those who use outdated, cliché methods. Determining the influence of ICT on educational and learning results in secondary schools in the Githunguri Sub-county, Kiambu County, was the goal of this research.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

This part outlines the methodology that was utilized by the researcher during data gathering, analysis and presentation while upholding ethical considerations.

3.1 Research Methodology

This survey involved both qualitative and quantitative techniques. These strategies were utilized on the grounds that they ensure broadness of perception and furthermore accommodate the precise spellbinding examination of attributes of a sample which can be utilized to make conclusion about populace. Besides, subjective exploration intends to

depict and examine the way of life and conduct of people and their gatherings according to the point of view of the analyst (Joyner, Rouse and Glatthorn, 2018).

3.2 Research Design

The survey utilized descriptive research methods. This technique allows the researcher to investigate educational issue by obtaining facts and opinions about the current conditions of the variables. Creswell and Creswell (2017) define the design of descriptive surveys as the study of a large number of people to discover related events, distributions and interrelations between sociological and physiological variables. Bryman (2016) called attention to that the fundamental reason for descriptive research is to portray the presence of occasions as they are. Study events in their natural occurrence without manipulating objects. The descriptive research design entails asking many individuals a set of the same questions through mail, telephone or face to face to capture essential information and to achieve the set objective. The on-going study employed a descriptive approach because it is capable of providing a clear picture and obtaining accurate data on the phenomenon being investigated.

3.3 Location of the Study

The research was done in public secondary schools in Githunguri sub-county, Kiambu county, Kenya. The Githunguri region is generally hilly and densely populated, with most (60%) of the population living in urban areas. Other neighboring sub-districts are the Kikuyu, Limuru, Lari, Lari, Kiambaa, Ruiru and Gatundu. The choice of research in this area is relied on the fact that most public schools receive ICT materials from governments and donors to promote education and learning. Therefore, it is essential to determine

whether the use of these ICT resources will affect education and learning. In addition, researchers have been working here for several years and are familiar with it.

3.4 Target Population

The survey population include 34 principals, 34 computer studies teachers and 2850 form three and four computer studies students making a total of 2918 participants. Principals were chosen based on the urgent need to coordinate, implement, and evaluate ICT integration in individual schools. In addition, trainers play a significant role in functionally predicting the utilization of ICT in education and learning. They would better provide meaningful data on the ICT usage in education and learning. The learners are also significant participants in this exam as they are the only recipients of revenue from proper and successful use of ICT.

Table 3.1 Target Population

Category	Target Population
Principals	34
Computer Studies teachers	34
Students (form three and four)	2850
Total	2918

Source: DEO's office Githunguri Sub-County (2019).

3.5 Sampling Techniques and Sample Size

3.5.1 Sampling Techniques

Purposive, stratified, and simple random sampling methods were utilized in the study. According to Kumar (2019), sampling is a method of selecting explicit individuals or a

small portion of the general population to make judgments about the general population while taking everything into account and measuring its characteristics. This is an illustration of the extraction procedure, which has the potential to address comprehensive community examination. The design is to assurance that the sample isn't restricted in size and is just about as close as conceivable to the attributes of the populace.

In this review, a purposive sampling technique was utilized to choose school principals and computer science teachers from the selected schools. The purposive sampling aimed at choosing the respondents possessing the features related with the study. Simple random sampling strategies were utilized to choose the learners to take an interest in the review. Stratified sampling was proper in light of the fact that it addressed all classifications dependent on populace extents, so there is no class of participants left. As per the stratified sampling methodology of Babbie (2015), the populace is partitioned into various layers as indicated by classifications.

3.5.2 Sample Size

Kumar (2019) defines the sample as a section of the target population that represents the features of the entire population. The study sampled 285 students out of 2,850 students. It is based on the Central Limit Theorem, and for any sample size ($N \geq 30$), the mean sample distribution is almost normal regardless of the total number of parent populations. 71 students from each tier were chosen by simple random sampling. Simple random sampling was suitable for this choice because it helps avoid bias among participants. Due to the small number of teachers, the researcher used the entire population of 10 teachers where purposeful sampling was used because the study was only for computer research

teachers. The researcher also conducted a purposeful sampling of the principals of the entire 10 schools. Table 3.2 below lists the distribution of participants: According to Orodho (2012), a sample size of 10% to 30% is sufficient to summarize the results of the study. During the study period, a total of 10 public secondary schools (30%) were sampled.

Table 3.2 Sample Size

PARTICIPANTS			
Category	Target Population (N)	Sample Size (n)	Percentage (%)
Principals	34	10	30%
Computer Studies teachers	34	10	30%
Computer Students (form 3&4)	2850	285	10%
Total	2919	305	

The sampling matrix yielded a total of 305 participants comprising of 10 Principals, 10 Computer studies teachers and 285 form three and four computer students. The study purposively sampled principals, and Computer Studies teachers to yield a 30% of the target population and only 10% of the Computer student population were sampled.

3.6 Research Instruments

3.6.1 Questionnaires

Joyner, Rouse and Glatthorn (2018) showed that the survey improved the diversity of data collection from larger samples and different locations. The questionnaires were provided to both students and teachers. The use of questionnaires as a tool for this study was very efficient as it allows the researcher to gain personal insights from participants. This

include open and closed surveys for two types of surveys. Both teacher and student surveys were used. For ICT reasons, questionnaires for teachers were utilized to gather data about the ICT influence on secondary school education and learning outcomes, and student questionnaire was the attitude of ICT. Teacher questionnaires contained a combination of open and closed questions aimed at exploring the influence of ICT on supporting educational and learning outcomes. Some survey questions are displayed on a 5-point Likert scale (see Appendix II). The self-managed student survey contains closed and open questions formed on a 5-point Likert scale (see Appendix III).

3.6.2 Observation Schedule

Observation is a means of providing data about actual behavior. By direct observation, researcher can use practice in context to better understand it (Orodho, 2012). The lesson observation plan is used in all grades of interest, the third grade. Observation planning is important because you don't have to worry about your research being biased or non-subjective. The outcomes are not controlled by participants' past or future behavior. Finally, this method is not as demanding as using interview schedules or questionnaires, as it does not require participants to participate in the study. The teachers and learners' nature were also observed. It also analyzes the available ICT resources, ICT resources and the nature of the interaction between teachers and students.

The observer collects data on the impact of ICT on secondary school education and learning outcomes. During the lesson observation process, the researcher sat behind the classroom and recorded the impact of all observed content in the current lesson on the influence of ICT on secondary school learning and education. The number of textbooks for each session, how they are used, and their interactions in the classroom are recorded.

A 10-hour class gave researcher the opportunity to experience what is happening in a natural classroom environment and understand whether the information provided to students and teachers in the survey is effective.

3.7 Pilot Study

This is the basis of this research study (Bryman, 2016) as it helps to achieve the suitability and stability of the research equipment and hardware. The survey utilized simple sampling technique to choose two school for the pilot study. The selected schools were omitted from the final scope of information. Class awareness plans and surveys are created and tested using school photos from selected overview areas. Pilot study was done to address the validity and reliability of the review tools. Nevertheless, components that were deemed ambiguous and confusing during the pilot investigation were updated in a similar manner.

3.7.1 Validity

Validity is the accurateness and beneficial value of the derivation based on the sequelae of the study (Creswell & Creswell, 2017). To guarantee that the data collected from the field is precise and significant, the researcher must choose the substantive legitimacy of the instrument. To explore the validity of a research instrument substance, research work with supervisor to examine the research instrument substance and respond normally to the check when survey questions measured what it supposed to measure. The data source

contains ideas, advice, and explanations that are fully integrated into the further development of the tool.

3.7.2 Reliability

As per the Creswell and Creswell (2017), reliability refers to how predictable findings are over time. In this case, instrument reliability is determined by how often it produces similar results during first inspections. The reliability of the research equipment was assessed using test-retest methods. To do this, the researcher dispatched the questionnaire to the computer studies teachers of chosen schools who were left out of the final study. A week later, the researcher returns to the same subject and administer a new questionnaire. At this point, the data were analyzed to establish the dependability factor using Pearson's product-moment correlation equation. In the 0 to 1 range, Cronbach's alpha coefficient was applied. Kothari (2009) asserts that an instrument is reliable for research if its correlation coefficient is 0.7 or above. The reliability index of the research tools was 0.786, indicating that they were trustworthy.

3.8 Data Collection Procedures

The necessary study permits were acquired from University as well as the sub county education office by the researcher to conduct the study. The researcher eventually visited every one of the chosen schools and gave the polls to the instructors and students who had been sampled. Joyner, Rouse, and Glatthorn (2018) declares that a journal is fundamental for researchers not exclusively to record information yet in addition to record their activities and exercises. The researcher pre-visited the specific schools ahead of time to

get permission from the administrations and to get to know the participants. The researcher then sent surveys to the schools and provided the participants an excellent opportunity to respond before collecting the questionnaires. On alternate days, classes were observed in order to gather data about the availability of ICT resources through observation and recording.

3.9 Data Analysis

After the data collection, data was cleaned by checking for any missing information. Descriptive and inferential statistics were used to break down quantitative information (Almalki, 2016). Descriptive statistics includes the utilization of frequencies, rates and means. The Statistical Package for Social Sciences (SPSS v. 26) was utilized to analyze the quantitative data.

Open-ended questions and observation guides were utilized to gather data that was then rigorously coded and organized to provide categories and themes based on the study questions. The information about the influence of ICT on student outcomes was then displayed by the researcher in quotation and verbatim forms.

3.10 Logistical and Ethical Considerations

3.10.1 Logistical Considerations

Before starting to collect data, researcher acquired all necessary documents, including a cover letter from Graduate School, Kenyatta University and research permit from NACOSTI. The researcher likewise sought for research authorization from the Kiambu

County Education Office to complete exploration. From that point, the organization of each sampled school was reached preceding the beginning of the field study.

3.10.2 Ethical Considerations

Moral issues were considered during the study which incorporate deliberate investment, informed assent, secrecy and namelessness, the potential for damage and conveying results. The idea of the study was disclosed to them and any inquiries on obscurity and secrecy were replied. Interest in the research was intentional and participants were permitted to pull out from the review if they wished to. The members were consoled that their ways of life just as the data was stay secret.

CHAPTER FOUR

PRESENTATION OF FINDINGS, INTERPRETATION AND DISCUSSION

4.1 Introduction

This part presents the study's outcomes. This section is broken up into two sections: the demographic details of the participants and the outcomes in relation to the survey questions. The findings were displayed as per stated sections:

- i. Demographic features of participants
- ii. Adequacy of ICT tools
- iii. Utilization of ICT tools in teaching and learning
- iv. Teachers and learners' attitudes towards ICT usage in teaching and learning
- v. Challenges facing utilization of ICT in teaching and learning

4.2 Response Return Rate

Table 4.1 Surveys Return Rate

Participants	Distributed questionnaires	Return Rate	Percentage
Principals	10	8	80.0
Teachers	10	9	90.0
Students	285	230	80.7
Total	305	247	81.0%

Source: Field Data, 2022

In the ten sampled secondary schools in the Githunguri Sub-County, the scholar distributed a total of 305 surveys to the learners, teachers and principals of the sample. However, the researcher received a complete questionnaire from only 247 participants. The participants' overall return rate is 81.0%, as shown in Table 4.1. According to Kothari (2007), a return rate of 75% or higher reduces sampling bias and makes a study more representative.

4.3 Participants' Demographic Features

This kind of research requires participants' background information. The study looked at gender, age, educational level, school category, working experience, and students' class.

4.3.1 General Features of Teachers and Principals

Gender, age, education level, and work experience were the background characteristics that were determined from the principals' and teachers' perspectives. Table 4.2 provides a summary of the participants' responses.

Table 4.2 General Characteristics of Teachers and Principals

	Principals		Teachers	
	F	%	F	%
Gender				
Male	6	75	5	55.6
Female	2	25	4	44.4
Age				
30-40 Years	3	37.5	3	33.3
Above 40 Years	5	62.5	6	66.7
Educational level				
Diploma	-	-	2	22.2
Bachelor's Degree	4	50	5	55.6
Master's Degree	4	50	2	22.2
Working Experience				
1-5 years	2	25	3	33.3
6- 10 Years	3	37.5	4	44.4
More than 10 Years	3	37.5	2	22.2

Source: Field Data, 2022

The outcomes in Table 4.2 depicts that 75% of principals and 55.6 percent of teachers in this survey were male, while 44.4 percent of teachers and 25% of principals were female.

This shows that male dominate in teaching secondary schools as compared to female. The fact that most of the schools in the survey's sample are mixed-gender schools and that there are more male teachers than female teachers explains the disparity.

The findings indicate that 37.5 percent of principals and 33.3 percent of teachers were between the ages of 30 and 40, while 62.5 percent of principals and 66.7 percent of teachers were over 40. This demonstrates that the majority of educators and principals were relatively mature. As a result, they provided useful data regarding how ICT impacted learners' educational performance in secondary schools.

The results specifically uncovered that 55.6% of teachers and 50% of principals had bachelor's degrees in education, while 22.2 percent of teachers and 50% of principals had master's degrees. Additionally, 22.2% of teachers held an education diploma. This indicates that each principal and teacher received adequate training and was capable of offering well-informed thoughts concerning the impact of ICT on student performance.

Relating to experience, 25 percent of principals and 33 percent of teachers had less than five years of experience, while 75 percent of principals and 66.6% of teachers had more than five years. This demonstrates that numerous participants had worked for their respective schools for a significant amount of time, making them better suited to provide the data the research tools needed. These characteristics, according to Rogers (2003), are significant because they identify those who embrace, disseminate, implement, and convince others to use the innovation. Currently, the principals are in charge of bringing ICT into their schools and integrating it.

4.3.2 Students' Demographic Features

Gender, age, and class were utilized as background characteristics to assess students' comprehension of the questionnaire and ability to respond. Table 4.3 provides a summary of the participants' responses.

Table 4.3 Students' Demographic Features

	F	%
Gender		
Male	136	59.1
Female	94	40.9
Age		
15-17 Years	125	54.3
18 - 20Years	80	34.8
20 and above	25	10.9
Class		
Form 3	153	66.5
Form 4	77	33.5

Source: Survey Data, 2022

The outcomes shown in Table 4.3 clearly display the demographic details of the study's sampled pupils. In terms of gender, 40.9% of students were female and 59.1% were male. The minimal female learners in the selected schools can be used to explain the gender discrepancy.

In terms of age, 54.3% of students were between the ages of 15 and 17, 34.8% were between the ages of 18 and 20, and 10.9% were 20 or older. The participants' ages demonstrated that students were of an age where they could provide information about how ICT affected their performance.

Due to their knowledge of ICT use in the educational system, the study focused on form 3 and form 4 students in terms of education level. The senior classes were more knowledgeable about the state and use of ICT in their schools, therefore the information gained was essential for the study. Forms 3 and 4 were discovered to have more thorough responses regarding how ICT affected their academic achievement.

4.4 Adequacy of ICT tools utilized in teaching and learning

The teachers were required to answer the question "Yes" or "No" about the availability and indicate whether or not the facilities were adequate. Table 4.4 displays the outcomes of the teachers' responses.

Table 4.4 Response on availability and adequacy of the ICT Hardware by computer teachers

	Available		Not Available		Adequate		Not Adequate	
	F	%	F	%	F	%	F	%
Computers	6	66.7	3	33.3	4	66.7	2	33.3
Internet	4	44.4	5	55.6	3	75.0	4	25.0
Printers	7	77.8	2	22.2	3	42.9	4	57.1
Projectors	3	33.3	6	66.7	1	33.3	2	66.7
Scanner	2	22.2	7	77.8	-	-	2	100
DVDs/VCD Players	2	22.2	7	77.8	1	50.0	1	50.0
Computer laboratories	5	55.6	4	44.4	3	80	2	40

Source: Survey Data, 2022

According to the results presented in Table 4.4, 66.7% of instructors reported that computers were available in schools, 44.4% reported that the internet was available, 77.8% reported that printers were available, 33.3% reported that projectors were available, 22.2% reported that scanners were available, 22.2% reported that DVD/VCD players were available, and 55.6% reported that computer labs were available. This indicates that the schools that took part in the study have access to ICT resources.

Table 4.4 displays that, in terms of the adequacy of ICT infrastructure, 33.3 percent of instructors stated that their computers were inadequate, and 25 percent of teachers stated that their internet connectivity was inadequate. In addition, 57.1 percent of teachers stated that printers were inadequate. Regarding the projectors, 66.7 percent of teachers stated that they were inadequate. In addition, 100% of educators stated that scanners were insufficient. 50% of teachers stated that DVDs and VCD were inadequate. The findings indicate that the laboratories were inadequate for forty percent of teachers. In addition, every teacher stated that the computers in their schools had Microsoft software, a word processor, PowerPoint, and databases installed.

Additionally, an observational guide was used by the researcher to verify the teachers' responses. Despite the fact that the schools being studied had these resources, teachers' claims that some schools still lacked appropriate computers, scanners, internet access, and printers were supported by the findings. The researcher noted that computer technicians were found in only two of the ten schools sampled for the survey. According to the findings, DVD players were insufficient. The increasing rate of technology's obsolescence could account for this. These outcomes are upheld by a study by Nchunge, Sakwa, and Mwangi (2012), who discovered that, despite the fact that some Kenyan schools had computers, there might have only been one in the principal's office. He reached the resolution that not very many schools had enough ICT assets for educating and learning. The findings were also supported by the results of Makhanu and Kamper (2010), who found that schools' inadequate ICT infrastructure prevents its integration into education. The majority of principals' schools lacked adequate ICT resources, so the proportion of schools with adequate ICT resources was low. This also backs up Farewell's (2007) claim

that one of Africa's biggest issues right now is access to ICT resources. The survey uncovered that the surveyed schools have ICT facilities but insufficient to cater all learners.

4.5 Utilization of ICT in Teaching and Learning

This part describes the impact of ICT on the scholastics execution of learners, degree to which teachers and principals are prepared to utilize ICT in the classroom, the degree to which ICT is incorporated into teaching and learning, and the educational outcomes of schools across a variety of subjects.

4.5.1 Teachers and Principals' Preparedness to utilization ICT

Both teachers and principals were inquired if they had sufficient skills in the ICT utilization, whether they had showed up any in-service training, and the training sponsors they had attended in order to explore the degree they had prepared to the ICT integration in their schools.

Table 4.5 Responses on preparedness to use ICT by Teachers and Principals

	Principals				Teachers			
	Yes		No		Yes		No	
	F	%	F	%	F	%	F	%
Adequate skills in the use of ICT	5	62.5	3	37.5	6	66.7	3	33.3
Attended in-service training	6	75	2	25	5	55.6	4	44.4
Sponsored by government	4	50	4	50	5	55.6	4	44.4
Sponsored by donors	3	37.5	5	62.5	4	44.4	5	55.6
Self-sponsored	2	25	6	75	3	33.3	6	66.7
Parents	2	25	6	75	2	28.2	7	77.8

Source: Field Data, 2022

Table 4.5 depicts that 75% of principals and 55.66% of teachers had attended in-service training, and that 62.5 percent of principals and 66.7 percent of teachers had adequate ICT skills. The findings indicate that the government sponsored 50% of principals and 55.6 percent of teachers for in-service training, a donor sponsored 37.5% of principals and 44.4% of teachers, and self-sponsored 25% of principals and 33.3% of teachers. In addition, parents sponsored 25 percent of principals and 28.2% of teachers. Because more than 50% of teachers and principals in Githunguri Sub-County have satisfactory skills in the ICT usage, this suggests that the teachers and principals' preparedness to ICT is not a major obstacle to the ICT integration into teaching and learning secondary schools. Preparing for the process of integrating ICT into teaching and learning is required to make learning more meaningful and productive. The survey emphasized principal's management change agents for enhancing performance, which is consistent with Makhanu's (2010) findings regarding principals' literacy in ICT.

Table 4.6 Responses on the Perceived needs in ICT training by Teachers and principals

Statement	SA		A		NS		D		SD	
	F	%	F	%	F	%	F	%	F	%
Taking into account the ongoing instruction of the new technology in education, every teacher must be trained on ICT skills.	14	82.4	3	17.6	-	-	-	-	-	-
Teachers who are regular users of ICT must also be trained on ICT for teaching and learning	9	52.9	6	35.3	-	-	2	11.8	-	-
ICT training is a waste of time	2	11.8	1	5.9	-	-	1	5.9	13	76.5
Teachers in-service on the use of ICT in education is very crucial	12	70.6	4	23.5	-	-	1	5.9	-	-

Source: Field Data, 2022

In light of the ongoing introduction of new technologies, 82.4% of participants strongly agreed that every teacher should receive ICT training, according to the data in Table 4.6. The study also found that even people who already use ICT need training on how to use it in education, with 35.3% and 51.9 percent strongly agreeing.

The findings indicated that 76.5 percent of participants strongly disagreed that training of ICT is a waste of time, besides 70.6% of participants strongly agreed that in-service training on the usage of ICT in education is extremely important. Osodo (2004), who found that teachers have a noteworthy impact on how ICT is used in the classroom, found that ICT teaching and learning requires technical support.

4.5.2 Level of ICT Utilization in Teaching

Participants were asked to demonstrate their ability to incorporate ICT into their classrooms in order to determine whether or not teachers are prepared. Generally, somewhat, To lesser degree, Not certain, Not in any way shape or form. Table 4.7 displays the outcomes.

Table 4.7 Responses on ICT utilization level in teaching by teachers and principals

Statement	To a great extent		To some extent		To lesser extent		Not Sure		Not at all	
	F	%	F	(%)	F	%	F	%	F	%
Teachers have undergone computer literacy classes	16	94.1	-	-	8	5.9	-	-	-	-
Utilization of ICT's featuring in the syllabus	15	88.2	-	-	2	11.8	-	-	-	-
Students have some basic ICT literacy skills	14	82.4	-	-	3	17.6	-	-	-	-
Relevant software have been installed to facilitate the integration of ICT in education	13	76.5	-	-	4	23.5	-	-	-	-

Source: Survey Data, 2022

According to the results in Table 4.7, 94.1% of participants have some level of computer literacy, while 5.9% have less. According to the findings, 88.2% of participants confirmed the integration of ICT. This demonstrates that instructors use ICT in their classrooms and that they have ICT skills. The teachers' findings are in contradiction to those of Wanjala (2013), who found that many teachers were unprepared and lacked ICT skills. It demonstrates that 94.1 percent of learners possess ICT literacy skills and perform well in subjects that incorporate ICT. Table 4.7 depicts that 76.5 percent of participants said that the right software was installed in their schools to make it easier to integrate ICT. It was evident from the survey that most teachers were ready to incorporate and use ICT in the classroom, that pupils had ICT capabilities, and that schools had the necessary software. The results are in direct opposition to Andoch's (2012) argument that despite massive investments in ICT infrastructure, tools, and skills development to enhance teaching in many nations, there is no evidence that this has improved students' academic achievement.

4.6 Attitudes towards the usage of ICT in the Teaching and Learning.

In this study, it was crucial to measure the teachers', and students' attitudes concerning utilizing ICT for teaching and learning since attitudes affect how individuals utilize technology. A 5-Likert scale was utilized to measure it from Strongly Agree to Strongly Disagree. The results of a statistical analysis of the findings for each participant's responses to several attitude items are shown in the next subsections.

4.6.1 Attitudes of Teachers towards the Utilization of ICT in Teaching and Learning.

To find out how they felt about the use of ICT in education, teachers were inquired to answer to statements on a 5-point Likert scale that ranged from strongly agreeing to strongly disagreeing. Table 4.8 displayed the outcomes.

Table 4.8 Responses regarding attitudes of teachers towards ICT usage in the Teaching and Learning

Statement	SA		A		NS		D		SD	
	F	(%)	F	(%)	F	(%)	F(%)	F	(%)	
I like computer technology.	16	82.4	3	17.6	-	-	-	-	-	
The integration of ICT into curriculum will enable the teacher cover the syllabus in time.	10	58.8	4	23.5	-	-	2	11.8	5.9	
ICT enhance students' performance	9	52.9	5	29.4	-	-	3	17.6	-	
ICT is useful to teachers in their attempt to attain the teaching objectives.	11	64.7	4	23.5	1	5.9	1	5.9	-	
I prefer using overhead projectors or LCD projectors in teaching rather than chalk and board.	3	17.6	8	47.1	-	-	2	11.8	17.6	
ICT develops a more autonomous learner centered in teaching and learning.	6	35.3	7	41.2	2	11.8	2	11.8	-	
The utilization of the internet for teaching and learning encompasses risks to students.	4	23.5	2	11.8	-	-	7	41.2	23.5	
Students perform well in my subject because of the use of ICT.	15	88.2	2	11.8	-	-	-	-	-	
I prefer to teach using traditional methods rather than ICT.	3	17.6	2	11.8	1	5.9	4	23.5	41.2	
Whether ICT is utilized in education or not there will be no change in students' performance.	-	-	-	-	2	11.8	6	35.3	52.9	

Source: Survey Data, 2022

Table 4.8's findings indicate that the majority of participants enjoy using computers, as evidenced by the fact that 82.4% (teachers and principals) strongly agreed and 17.6% agreed. 64.7% of participants strongly agreed with the statement that ICT helps teachers achieve their teaching goals, while 23.5 percent agreed. Whether the teacher will be able to cover the syllabus in a timely manner with ICT integration into the curriculum, 58.8% of participants strongly agreed and 23.5 percent agreed. 41.2 percent of participants strongly disagreed that they prefer to teach through traditional methods rather than ICT. This shows that a lot of teachers are in favor of using ICT in the classroom and have a positive attitude about it. This is in line with the claim made by Wanjala (2013) that teachers' attitudes determine how ICT is integrated into schools and how it affects students' academic performance.

A total of 51.9 percent of participants strongly agreed that ICT integration improves students' performance, and 29.4 percent agreed that it does so. Also, 88.2% of participants strongly agreed that learners in my subject perform well since they use ICT. Students' performance will not change whether ICT is integrated into education or not, according to 51.9 percent of participants, who strongly disagreed and 35.3 percent of participants who disagreed. This demonstrates that educators concur that students' academic performance is improved by ICT. 35.3% of participants strongly agreed, 41.2 percent agreed, 11.8% of teachers were unsure, and 2.9% of teachers strongly disagreed about whether ICT fosters a more autonomous learner centered on teaching and learning. In addition, 44.1 percent of participants agreed of teachers agreed that the use of the internet for education poses risks to students. The majority of principals and teachers, according to the study, have a

positive attitude toward the integration of ICT into teaching and learning, so their attitudes do not hinder ICT integration.

4.6.2 Students' attitudes towards the ICT utilization in Teaching and Learning

Using a 5-point Likert scale that ranges from "Strongly Agree" to "Strongly Disagree"; Students express their views regarding the ICT integration in education. Table 4.9 provides an overview of the outcomes.

Table 4.9 Students' attitudes towards the ICT utilization in the teaching and learning

Statement	SA		A		NS		D		SD	
	F	(%)	F	(%)	F	(%)	F	(%)	F	(%)
I like using computer technology in school.	90	58.8	36	23.5	6	3.9	16	10.5	5	3.3
ICT is useful to students in their attempt to attain the learning objectives	109	71.2	34	22.2	6	3.9	3	2.0	1	0.7
I use more ICT than textbooks	6	3.9	36	23.5	16	10.5	44	28.8	51	33.3
I understand well when teachers use overhead projectors in teaching rather than chalk and board.	42	27.5	44	28.8	12	7.8	33	21.6	21	13.7
I think that ICT improve my performance	43	28.1	26	17.0	16	10.5	30	19.6	38	24.8
I use ICT to relax and chat with friends	54	35.4	39	25.5	11	7.2	12	7.8	37	24.2
I support the use of ICT in the classroom because I perform well with the use of ICT	63	41.2	51	33.3	6	3.9	14	9.2	19	12.4

Source: Survey Data, 2022

According to the results in Table 4.9, the majority of students enjoy using computers, with 23.5 percent agreeing with the statement "I like using computer technology in school" and 58.8 percent strongly agreeing. Also, 71.2 percent of students strongly agreed that ICT helps learners achieve the learning objectives. This indicates that students view the integration of ICT positively. Numerous learners use more textbooks than ICT, with 28.8 percent strongly disagreeing and 33.3% disagreeing with the statement, "I use more ICT than textbooks," according to the findings. This suggests that students lack sufficient access to ICT resources and still rely more on textbooks than on ICT. Additionally, according to the findings, 25.5% and 35.4% of students indicated that they use ICT to unwind and converse with friends, respectively. This suggests that the majority of students utilize ICT for social rather than academic purposes.

Students' performance is improved by ICT integration, according to 17.0% and 28.1% of students, respectively, who agree and strongly agree. Additionally, due to their high academic performance, 33.3 percent of students agreed and 41.1 percent strongly agreed that they upkeep the ICT usage in the classroom. These results showed that students don't know how ICT might affect their performance. Children's confused attitudes regarding ICT integration and performance do not prevent ICT from being integrated into their learning because they are willing to utilize ICT and want computer classes until they reach the fourth grade. This backs up the findings of Oldfield's (2010) study, which remarked that the ICT influence on learners' attainment is still difficult to quantify and the subject of a lot of valid debate.

4.7 Challenges Faced in ICT Utilization

Additionally, the survey investigated the difficulties principals, teachers, and learners faced when utilizing ICT to improve academic performance. An overview of the participant responses can be found in Table 4.10.

Table 4.10 Responses of the Challenges faced by the Principals and Teachers

Challenges	F	%
Shortage of internet connectivity	15	88.2
Inadequate ICT facilities	12	70.6
Lack of Trained personnel	12	70.6
Lack of Lab/ lab technician	11	64.7
Shortage of large room	10	58.8
Lack of support from the administration	8	47.1
Workload/ exam pressure	6	35.3
Lack of interest from the teachers	16	29.4

Source: Survey Data, 2022

The outcomes indicate that 70.6% of participants mentioned that there were insufficient ICT facilities. This indicates that one of the primary issues schools face is inadequate ICT facilities. According to Jones' (2009) study, teachers' lack of confidence and skill, as well as their lack of understanding of the potential of ICT integration to improve learners learning, were the primary barriers to embracing ICT in schools. These findings support Jones' findings. Teachers who lacked the expertise or access to ICT resources to integrate ICT also performed poorly in their subject areas.

Additionally, 88.2% of participants mentioned a lack of internet connectivity. This means that teachers didn't have access to videos related to the subjects they teach because they didn't have enough internet connectivity. This demonstrates that teachers were unable to fully incorporate ICT into their teaching due to a lack of adequate internet connectivity and inadequate facilities, despite their positive attitude toward incorporating ICT into instruction to improve students' performance.

The lack of computer rooms to accommodate students in computer classes was another issue raised by 58.8% of participants. Also, 70.6% of participants cited a challenge that hinders the ICT integration in schools and learners' performance as a lack of ICT-trained personnel. Additionally, the difficulty posed by the absence of lab technicians was mentioned by 64.7% of participants, and the lack of support from the administration was mentioned by 47.1% of participants. This suggests that principals oppose the use of ICT by teachers in the classroom. Last but not least, 35.3% of participants stated that they were too busy grading tests and homework to incorporate ICT into their instruction due to their workload. This is in line with a study by Kimitei (2008) that found that ICT integration in Nairobi's secondary schools was unsuccessful due to a lack of administrative support. The scholar discovered while finalizing the observation guide that different teachers' utilization of technology was influenced by their ICT facilities access.

4.7.1 Challenges faced by the students in the ICT integration in the Learning

The learners were asked to describe any difficulties they encountered when incorporating ICT into their education and how these challenges affected their performance. Their responses are displayed in Table 4.11

Table 4.11 Difficulties faced by students during ICT utilization in Learning

Challenges	Frequency	Percentage
Inadequate skills	99	64.7
Harassment from computer teacher	99	64.7
Inadequate ICT facilities	79	51.6
Dirty Web site	79	51.6
Lack of Trained personnel	74	48.4

Source: Survey Data, 2022

According to Table 4.11, the two main obstacles mentioned by 64.7% of students were teacher harassment and inadequate skills. This indicates that instructors are also subsidizing to the negative attitude of learners toward the ICT integration into learning in addition to lacking the necessary skills. The results showed that 51.6 percent of students said their schools didn't have bad ICT facilities. Also, 51.6 percent of learners stated the difficulty of connecting to a dirty website. Also, 48.4% of students said that students' performance and integration of ICT are affected by a lack of trained staff. This exemplifies the negative impact of ICT integration by demonstrating that learners use ICT to access shady websites that mislead them. This corroborates Wanjala's (2013) research, which found that many secondary school students in Nairobi were primarily utilizing ICT to download pornographic movies rather than educational materials.

4.8 Approaches to Overcome Challenges

The goal of the research question was to find solutions to the problems that certain schools have integrating ICT and how it affects students' performance. The strategies used by teachers and students were compiled into each table in the following section.

4.8.1 Teachers' Views on Approaches to Overcome Challenges

The instructors were inquired to state the approaches used to overcome challenges faced during ICT utilization in school. The outcomes were exhibited in Table 4.12.

Table 4.12 Teachers' Strategies to Overcome Challenges

Strategies/ Solutions	F	%
Good internet connectivity	8	88.9
Purchase more ICT equipment	7	77.8
Employ trained personnel and lab technician	6	66.7
To build a larger computer room	5	55.6

Source: Survey Data, 2022

In order to help teachers, incorporate ICT into their classroom and boost student performance, 77.8% of teachers recommended that administrators buy more ICT equipment, according to the findings shown in Table 4.12. In order to accommodate more students and create a comfortable environment for computer studies, 55.6% of teachers recommended that schools build larger computer classrooms. Also, 66.7% of educators supported employing more trained lab technicians. As a result, teachers will have more time to develop PowerPoint presentations and other teaching resources so they may completely integrate ICT into their education. Also, 88.9% of educators suggested setting up internet connectivity to make it easier to download course-related content.

4.8.2 Students' Views on Approaches to Overcome Challenges

In the study's questionnaire, learners were inquired to suggest areas for upgrading in enhancing ICT integration. Table 4.13 exhibits a summary of the responses provided by the students.

Table 4.13 Students' Views on Approaches to Overcome Challenges

Strategies/ Solutions	Frequency	Percentage
Motivation of students	99	64.7
Purchase more ICT equipment	79	51.6
Build a larger room	76	49.6
Employ Lab/ Lab technician	52	39.9

Source: Field Data, 2022

The results showed that 64.7% of pupils thought teachers should cease bullying kids and promote ICT use instead. Table 19 shows that 51.6% of respondents think that schools should buy more ICT equipment to help teachers and students use the technology into their lessons in order to improve academic achievement. The results also show that 49.6% of students believed that larger computer rooms should be built in order to accommodate more pupils, while 39.9% of students said that lab technicians should be hired by schools.

Also, it was found that ICT improves students' academic performance in Githunguri Sub-County, as evidenced by the directors' occasional meetings. The investigation's findings suggest that principals should invest in more ICT infrastructure to help instructors and students integrate technology into all facets of education, especially the classroom. To encourage children to form potential attitudes about ICT, teachers and principals must advise them softly and patiently. Because students will not learn everything on their own

and will need to be taught, teaching and learning are both arts. Both teachers and administrators need to actively participate in their own learning. Students, largely learn from examples, and they will climb to the degree of expectation that is anticipated of those who educate them, claims Rogers (2003). Principals should hire skilled personnel with ICT abilities to increase student performance and provide instructors with yearly in-service training on ICT because ICT has become an essential instrument in running our world today.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

An overview of the study's findings and conclusion is given in this chapter. Additionally, the chapter offers recommendations and suggestions for further study.

5.2 Summary of the Findings

The majority of participants noted that the syllabus included ICT integration and that integration is occurring to some extent. According to the findings of the survey, numerous schools lacked adequate ICT facilities. Regarding the sufficiency of ICT infrastructure, the findings revealed that the majority of computers in a few schools lacked printers, projectors, internet connectivity, and scanners.

As per the outcomes, majority of schools had ICT infrastructure that they had obtained from donors or from funds provided by the government. There were computers and projectors available as ICT equipment; printers and a whiteboard. All participants in the study were found to have; Students, teachers, and principals all enjoy using computers. The participants also said that using ICT in education helps teachers and principals achieve educational goals and improves students' academic performance. Also, teachers emphasized that using ICT allows them to cover their syllabus on time, which students clearly understood when they were incorporated into their instruction.

One of the main obstacles schools face, according to the participants, is a lack of ICT resources. They stated that there were insufficient computers, printers, and projectors, and

that even the few ICT facilities that were available were frequently insufficient for schools. The absence of ample classroom space for computer classes was another obstacle schools faced. The integration of ICT into schools is hampered by a lack of ICT-trained personnel, which also has an impact on students' academic performance. Another obstacle that many schools in the Githunguri Sub-County face is a lack of internet access.

5.3 Conclusions

The research concluded that students' academic performance improves when ICT is used in the classroom. It came to the conclusion that the majority of schools had access to ICT infrastructure that had been purchased with funds provided by the government. There were computers and projectors available as ICT equipment; printers, a whiteboard, and DVD and VCD players. However, many of the ICT tools that schools had were inadequate.

Participants generally have positive attitudes toward the integration of ICT in teaching and learning, despite the difficulty posed by inadequate facilities. Teachers' opinions regarding the use of ICT in schools' teaching and learning processes were positive, according to this study's findings. Some schools did not have the best ICT policies, especially for computer studies, and did not have enough ICT resources to help teachers teach and learn.

Numerous obstacles existed, including inadequate ICT facilities; inadequate lab technicians, a lack of ICT-trained staff, a lack of internet connectivity, and a lack of large classroom space for computer classes. Additionally, students developed a negative attitude toward ICT as a result of teacher harassment. It also came to the conclusion that

incorporating ICT into teaching and learning in Githunguri Sub-County can improve students' academic performance.

5.4 Recommendations

The survey highlighted the recommendations to the numerous significant partners regarding the coordination of ICT in teaching and learning in order to improve the academic achievement of students in public secondary schools. The Ministry of Education, principals, teachers, and students are all members of these stakeholders.

- i. ICT tools should be provided by the government: computers, printers, projectors, and labs, among other things, to help them incorporate ICT into schools to achieve educational objectives. Through the ministry of education, the government ought to increase funding for ICT projects in schools, construct more classroom space, and provide these establishments with additional ICT resources. In addition, the ministry of education ought to guarantee inexpensive, reliable, and accessible internet connectivity in all of the country's schools.
- ii. Principals of secondary schools should encourage all interested parties to buy the necessary ICT equipment to help students and staff perform better. Last but not least, many children have shown a desire to continue studying computer science till fourth grade, thus administrators should urge all pupils to do so in order to help them improve their performance.

- iii. Students should be encouraged to develop positive attitudes toward ICT by teachers, who should avoid harassing them even when they take time to comprehend. They should also take into account the different ways that students learn. This suggests that they ought to be familiar with their students and, when instructing through a variety of approaches and procedures, teaching aids, and concrete examples, the entire student population.
- iv. In order for students to use it appropriately, teachers should keep an eye on them. Students ought to be aware of the significance of incorporating ICT into education, as doing so has the potential to boost their performance and broaden their horizons. They should avoid websites that could mislead them and use the internet appropriately to download study-related content.

5.5 Suggestions for Further Research

The impact of information, communication, and technology on teaching and learning outcomes for students in public secondary schools in Githunguri Sub-County was the main emphasis of this study. For the research results to be applied broadly, a comparable study needs to be carried out in other geographical areas.

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APPENDICES

Appendix I: Introductory Letter

Dear Participant,

My name is **LUCY NYOKABI KAGO** currently taking a graduate degree at Kenyatta University (K.U). I am undertaking a research project, ***“Information Communication Technology Influence on Teaching and Learning Outcomes Among Secondary Schools in Kiambu County, Kenya”***. You have been chosen to take part in the study and your contributions will be exceptionally valued. When this investigation is finished, it will empower the education ministry and partners call attention to the influence of ICT on instructing and learning outcomes among secondary schools and thus enhance the academic achievement. This data may likewise be utilized by the Government organizations to take informed actions concerning the influence of ICT on teaching and learning outputs.

You may need between 15 and 30 minutes to complete this questionnaire. Please respond to each question as honestly as you can, as the study's findings will entirely depend on your answer. Please don't include your name in the information you provide; it will be kept private and used exclusively for educational purposes.

I appreciate you taking the time to provide me with the knowledge you have.

Yours sincerely,

LUCY NYOKABI KAGO
E55/CE/25947/2013

Appendix II: Questionnaire for principals

Section A: Bio Data

The aim of this exploration is to explore ICT influence on learning and teaching outputs among secondary schools in Kiambu County, Kenya. Please answer the questions given as sincerely and as correctly as possible. The responses which you will give will be treated with utmost discretion and confidentiality. Kindly understand each sentence and keenly tick the suitable response. Fill up your information opinion in the spaces provided.

1. Gender
Female [] Male []
2. Age
20-29 years []
30-39 years []
40-49 years []
Above 50 years []
3. What is your highest educational level?
Diploma []
Degree []
Masters []
PhD []
4. For how long have you been working as a principal?
.....
5. What is the size of the student population in your school?.....

Section B: Adequacy of ICT tools

6. Do you have ICT department in your school?
Yes []
No []

7. Use Likert Scale to show your agreement level i.e. from 1- strongly agreed to 5- strongly disagreed

S/N	Statement	1	2	3	4	5
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1	The ICT department in the school is fully equipped					
2	The school has internet facility					
3	The school has adequate computers					
4	There is a computer experts who assist learners and educators while using ICT in school					
5	There is in-service training opportunities to prepare teachers with ICT skills					
6	Teachers adequately utilize ICT tools in teaching					

Section C: Utilization of ICT tools in teaching and learning

8. On average how often do teachers utilize ICT materials in teaching and learning

Always []

Sometimes []

Never []

9. Utilizing ICT resources improves academic performance

Always []

Sometimes []

Never []

10. How can head teachers enhance ICT use in teaching and learning in their schools?

Kindly tick the most effective way.

Training teachers []

By buying more computers []

Internet connection []

Others(specify).....

Section C: Attitude, knowledge and capabilities in ICT

11. How regular have you joined an ICT class in teaching?

Once a year []

Twice a year []

Never []

Others (kindly specify)

12. Use Likert Scale to show your agreement level i.e. from 1- strongly agreed to 5- strongly disagreed

	1	2	3	4	5
Basic computer skills, not essentially restricted to teaching					
Improvement of ICT teaching methods in different subject areas of teaching and classroom management					

Utilizing of ICT software and hardware, but related to teaching and learning					
--	--	--	--	--	--

13. Use Likert Scale to show your agreement level i.e. from 1- strongly agreed to 5- strongly disagreed on attitudes concerning utilization of computers learning and teaching.

Statement	1	2	3	4	5
ICT can upgrade learners' language and composing abilities					
ICT will in general expand learners learning inspiration					
The Internet can offer freedoms to instructors for getting course content					
ICT can upgrade instructor and learner connection					
ICT can upgrade coordinated effort among learners					
ICT can upgrade learner cooperation and criticism to instructors					
Computers can improve learners' basic reasoning abilities					
ICT can improve instructing and learning measures					

Section D: Challenges in ICT usage

14. Use Likert Scale to show your agreement level i.e. from 1- strongly agreed to 5- strongly disagreed on challenges in ICT utilization.

Challenges	1	2	3	4	5
Absence of computer based learning materials					
School is lacking for coordinating ICT in learning programs					
Unseemly teacher preparation					
Low computers proficiency level among learners					
Absence of inspiration and trust in utilizing ICT					
Centralization of computers in a research facility					
Absence of ICT abilities					
Instructors don't approach ICTs at home to enhance the ICT abilities					
Absence of sufficient specialized help for ICT projects					
Inadequate computers					

15. State other barriers apart from the mentioned above.

Thanks

Appendix III: Questionnaire for Teachers

The aim of this exploration is to explore ICT influence on learning and teaching outputs among secondary schools in Kiambu County, Kenya. Please answer the questions given as sincerely and as correctly as possible. The responses which you will give will be treated with utmost discretion and confidentiality. Kindly understand each sentence and keenly tick the suitable response. Fill up your information opinion in the spaces provided.

A: Bio Data

1. What is your gender?

Female [] Male []

2. Age

20-29 years []

30-39 years []

40-49 years []

Above 50 years []

3. What is your highest educational level?

Diploma []

Degree []

Masters []

PhD []

4. For how long have you been working as a teacher?

.....

Section B: Adequacy of ICT tools

5. Kindly indicate whether an ICT department is available in your school?

Available []

Not available []

6. Use Likert Scale to show your agreement level i.e. from 1- strongly agreed to 5- strongly disagreed

S/N	Statement	1	2	3	4	5
1	The ICT department in the school is fully equipped					
2	The school has internet facility					
3	The school has adequate computers					
4	There is a computer experts who assist learners and educators while using ICT in school					
5	There is in-service training opportunities to prepare teachers with ICT skills					
6	Teachers adequately utilize ICT tools in teaching					

Section C: Utilization of ICT tools in teaching and learning

7. On average how often do teachers utilize ICT materials in teaching and learning
 Always []
 Sometimes []
 Never []
8. Utilizing ICT resources improves academic performance
 Always []
 Sometimes []
 Never []
9. How can head teachers enhances ICT use in teaching and learning in their schools?
 Training teachers []
 By buying more computers []
 Internet connection []
 Others(specify).....

Section C: Attitude, knowledge and capabilities in ICT

10. How regular have you joined an ICT class in teaching?

Once a year []
 Twice a year []
 Never []
 Others (kindly specify)

11. Use Likert Scale to show your agreement level i.e. from 1- strongly agreed to 5- strongly disagreed

	1	2	3	4	5
Basic computer skills, not essentially restricted to teaching					
Improvement of ICT teaching methods in different subject areas of teaching and classroom management					
Utilizing of ICT software and hardware, but related to teaching and learning					

12. Use Likert Scale to show your agreement level i.e. from 1- strongly agreed to 5- strongly disagreed on attitudes concerning utilization of computers learning and teaching.

Statement	1	2	3	4	5
ICT can upgrade learners' language and composing abilities					
ICT will in general expand learners learning inspiration					
The Internet can offer freedoms to instructors for getting course content					
ICT can upgrade instructor and learner connection					
ICT can upgrade coordinated effort among learners					
ICT can upgrade learner cooperation and criticism to instructors					

Computers can improve learners' basic reasoning abilities					
ICT can improve instructing and learning measures					

Section D: Challenges in ICT usage

13. Use Likert Scale to show your agreement level i.e. from 1- strongly agreed to 5- strongly disagreed on challenges in ICT utilization.

Challenges	1	2	3	4	5
Absence of computer based learning materials					
School is lacking for coordinating ICT in learning programs					
Unseemly teacher preparation					
Low computers proficiency level among learners					
Absence of inspiration and trust in utilizing ICT					
Centralization of computers in a research facility					
Absence of ICT abilities					
Instructors don't approach ICTs at home to enhance the ICT abilities					
Absence of sufficient specialized help for ICT projects					
Inadequate computers					

14. State other barriers apart from the mentioned above.

Thanks

Appendix IV: Student's Questionnaire

Instructions

Please answer the questions by the use of a tick (√) in the appropriate bracket provided

Section A: Bio Data

1. Gender
Male ()
Female ()
2. What is your age: _____ years?
3. Form:
One []
Two []
Three []

Section B: Adequacy of ICT resources

4. In your opinion, do you think that ICT resources are adequately available for students
use? Please rate the adequacy of the ICT resources are in your school.

	Adequate	Fairly adequate	Inadequate
Computers			
Internet			
Projectors			
Computer lab			
Others			

Section C: Utilization of ICT resources

5. How often do you make use of ICT resources in learning?
Always []
Sometimes []
Never []
6. How do you agree or disagree with the following statement on utilization of ICT resources?

	Agree	Strongly agree	Disagree	Strongly Disagree
Improves performance				
Enhances knowledge acquisition				
Enhances team work				

Section D: Attitude, Knowledge and Skills on ICT use.

7. How often have you acquired computer skills for use in your studies?
Always []
Sometimes []
Never []
8. Taking computer studies as a subject improves ability to utilize ICT tools?
Agree []
Disagree []
9. How often do you use ICT resources to look for information?
Rarely []
Sometimes []
Never []
10. How do you look for the information using ICT resources?
On your own []
With the teacher []
Both []
Never []

Section E: Challenges to ICT implementation in schools

11. Which challenges do you face in the course of utilizing ICT in your studies?
.....
.....
12. Which measures do you propose that should be put in place to overcome the cited challenges in (7) above
.....
.....
13. How have you gained from the use of;
(a) Computers?.....
(b) The internet?.....
(c) Printers?.....

Thanks

Appendix V: Observation Schedule

Item	Utilized	Not utilized	Available adequate	Available and inadequate	Not adequate	Not available
Internet facility						
Radio						
Computer						
Telephone						
Tape recorder						
Overhead projector						
Film projector						
Cassette recorder						
Printer						
T.V set						

Appendix VI: Research Proposal Approval Letter



KENYATTA UNIVERSITY
GRADUATE SCHOOL

E-mail: dean-graduate@ku.ac.ke

Website: www.ku.ac.ke

P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 810901 Ext. 4150

Internal Memo

FROM: Dean, Graduate School

DATE: 14th February, 2022

TO: Lucy Nyokabi Kago
C/o Edu. Mgt. Policy & Curr. Studies Dpt.

REF: E55/CE/25947/2013

SUBJECT: APPROVAL OF RESEARCH PROPOSAL

We acknowledge receipt of your revised Research Proposal as per our recommendations raised by the Graduate School Board of 19th January, 2022 entitled **"Information Communication Technology Influence on Teaching and Learning Outcomes among Public Secondary Schools in Kiambu County, Kenya"**.

You may now proceed with your Data Collection, Subject to Clearance with Director General, National Commission for Science, Technology and Innovation.

As you embark on your data collection, please note that you will be required to submit to Graduate School completed Supervision Tracking and Progress Report Forms per semester. The Forms are available at the University's Website under Graduate School webpage downloads.

Thank you.

ELIJAH MUTUA
FOR: DEAN, GRADUATE SCHOOL

C.c. Chairman, Department of Edu. Mgt. Policy & Curr. Studies

Supervisors:

1. Dr. Samuel Waweru
C/o Department of Edu. Mgt. Policy & Curr. Studies
Kenyatta University

EM/inn

Appendix VII: Research Authorization From Kenyatta University



**KENYATTA UNIVERSITY
GRADUATE SCHOOL**

E-mail: dean-graduate@ku.ac.ke

Website: www.ku.ac.ke

**P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 8710901 Ext. 57530**

Our Ref: E55/CE/25947/2013

DATE: 14th February, 2022

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

Dear Sir/Madam,

**RE: RESEARCH AUTHORIZATION FOR LUCY NYOKABI KAGO – REG. NO.
E55/CE/25947/2013**

I write to introduce **Lucy Nyokabi Kago** who is a Postgraduate Student of this University. The student is registered for M.Ed degree programme in the **Department of Edu. Mgt. Policy & Curr. Studies**.

Lucy intends to conduct research for M.Ed Project Proposal entitled, **“Information Communication Technology Influence on Teaching and Learning Outcomes among Public Secondary Schools in Kiambu County, Kenya”**.

Any assistance given will be highly appreciated.





Yours faithfully,

A handwritten signature in blue ink, appearing to be 'E. Kimani'.

**PROF. ELISHIBA KIMANI
AG. DEAN, GRADUATE SCHOOL**

EM/Inn

Appendix VIII: NACOSTI Research Permit

 REPUBLIC OF KENYA	 NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION
Ref No: 732287	Date of Issue: 25/February/2022
RESEARCH LICENSE	
	
This is to Certify that Ms.. Lucy Nyokabi Kago of Kenyatta University, has been licensed to conduct research in Kiambu on the topic: INFORMATION COMMUNICATION TECHNOLOGY INFLUENCE ON TEACHING AND LEARNING OUTCOMES AMONG PUBLIC SECONDARY SCHOOLS IN KIAMBU COUNTY, KENYA for the period ending : 25/February/2023.	
License No: NACOSTI/P/22/15943	
Applicant Identification Number 732287	Director General Walter Mwangi NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION
Verification QR Code	
	
NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.	

THE SCIENCE, TECHNOLOGY AND INNOVATION ACT, 2013

The Grant of Research Licenses is Guided by the Science, Technology and Innovation (Research Licensing) Regulations, 2014

CONDITIONS

1. The License is valid for the proposed research, location and specified period
2. The License any rights thereunder are non-transferable
3. The Licensee shall inform the relevant County Director of Education, County Commissioner and County Governor before commencement of the research
4. Excavation, filming and collection of specimens are subject to further necessary clearance from relevant Government Agencies
5. The License does not give authority to transfer research materials
6. NACOSTI may monitor and evaluate the licensed research project
7. The Licensee shall submit one hard copy and upload a soft copy of their final report (thesis) within one year of completion of the research
8. NACOSTI reserves the right to modify the conditions of the License including cancellation without prior notice

National Commission for Science, Technology and Innovation
off Waiyaki Way, Upper Kabete,
P. O. Box 30623, 00100 Nairobi, KENYA
Land line: 020 4007000, 020 2241349, 020 3310571, 020 8001077
Mobile: 0713 788 787 / 0735 404 245
E-mail: dg@nacosti.go.ke / registry@nacosti.go.ke
Website: www.nacosti.go.ke

Appendix IX: Research Authorization Letter Form Kiambu County



MINISTRY OF EDUCATION State Department of Early Learning & Basic Education

Telephone: Kiambu (office)
FAX NO. 0768 970412
Email: directoreducationkiambu@yahoo.com

COUNTY DIRECTOR OF EDUCATION
KIAMBU COUNTY
P. O. Box 2300-00900
KIAMBU

When replying please quote

KBU/CDE/DEPT 8/Vol. I

22nd February, 2022

Ms. Lucy Nyokabi Kago
Kenyatta University
NAIROBI

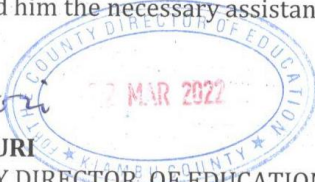
RE: RESEARCH AUTHORIZATION

Reference is made to NACOSTI letter NACOSTI/P/22/15943 dated 25th February, 2022. You have been authorized to conduct research on *"Information Communication Technology influence on teaching and learning outcomes among public secondary schools"* for a period ending 25th February, 2023.

Please accord him the necessary assistance.

AGNES THEURI

For: COUNTY DIRECTOR OF EDUCATION
KIAMBU COUNTY



MY EDUCATION, MY FUTURE

MY EDUCATION, MY FUTURE