INTEGRATION OF INFORMATION COMMUNICATION TECHNOLOGY IN TEACHING AND LEARNING IN PUBLIC PRIMARY SCHOOLS IN KAKAMEGA COUNTY, KENYA

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A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy in Curriculum Studies of South Eastern Kenya University

2024

DECLARATION

This thesis is my original work and has not been presented to any other institution for any other award. I understand that plagiarism is an offense and therefore, I declare that this thesis report is my original work and has not been submitted for any award in any other institution.

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ACKNOWLEDGEMENT

First and foremost, I would like to give thanks and praise to the all-powerful God for all of his blessings, strength and wisdom during my studies. I would also like to express my gratitude to South Eastern Kenya University for allowing me to pursue a Doctor of Philosophy in Curriculum Studies. I am also grateful to the Principal Secretary and the Ministry of Education for permitting me to conduct the study in public primary schools in Kakamega County. My supervisors, Dr. Janet K. Mulwa and Prof. Jonathan Muema Mwania, deserve a special note of appreciation for their unwavering commitment, devotion, tolerance and perseverance throughout the thesis-writing process. Their suggestions, direction and thoughtfulness made it feasible to do this task successfully.

The lecturers and staff at South Eastern Kenya University, Department of Educational Administration and Planning had an impact on my drive to study, comprehend and develop the field of Curriculum Studies through research. I would like to express my gratitude and appreciation to them. I would also like to thank the County Director of Education, Kakamega County, public primary school head teachers, public primary school teachers of the sampled schools, Kakamega County and my colleagues at Kitui Teachers Training College for their support and helpful criticism that helped to improve this work.

I would also like to express my profound gratitude to my parents, Zablon Mandila Ndochi and Leah Mito, as well as to my wife, Phyllis Nanjala Nabwela and my children, Ivan, Caren, Mikani, Kilian and Periscila for their steadfast support during the many difficult moments. Without a doubt, I would like to thank Mrs. Miriam Musanga Livoni for typing the manuscript quickly and precisely. I want to sincerely thank each and every one of you.

DEDICATION

This thesis is dedicated to my parents, Zablon Mandila Ndochi and Leah Mito, and my family: Phylis, Miriam, Wanina, Caren, Mikani, Kilian and Periscila who have shaped my life morally, spiritually, academically and financially. They will always be close to my heart.

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LIST OF ABBREVIATIONS AND ACRONYMS

B. Ed	**:**	Bachelor of Education
B. ICT	**:**	Bachelor of Information Communication Technology
CATL	**:**	Computer-Assisted Teaching and learning
CBC	**:**	Competence Based Curriculum
CD	**:**	Compact Disc
CDE	**:**	County Director of Education
CFSK	**:**	Computer for Schools Kenya
DIP / Ed	**:**	Diploma in Education
DLP	**:**	Digital Literacy Programme
DVD	**:**	Digitalized Video Disc
GoK	**:**	Government of Kenya
ICT	**:**	Information Communication Technology
INSET	**:**	In servicing of Teachers
KCSE	**:**	Kenya Certificate of Secondary Education
KCPE	**:**	Kenya Certificate of Primary Education
KICD	**:**	Kenya Institute of Curriculum Development
KIE	**:**	Kenya Institute of Education
KNEC	**:**	Kenya National Examinations Council
MDGs	**:**	Millennium Development Goals
M. Ed	**:**	Master of Education
M. ICT	**:**	Master of Information Communication Technology
MoE	**:**	Ministry of Education
NACOSTI	**:**	National Commission for Science, Technology and Innovation
NEPAD	**:**	New Partnership for Africa's Development
UNESCO	**:**	United Nations on Education, Science and Cultural Organization
SEKU	**:**	South Eastern Kenya University

DEFINITIONS OF SIGNIFICANT TERMS

County Director of Education: An individual in charge of county-level teacher management duties.

Digital content: Refers to educational materials that are available in digital form, such as audio, video files, graphics, animation and photographs for integration in teaching and learning.

Digital learning: Any type of learning that is aided by technology or by instructional practices that successfully make use of technology.

Head teacher: The main educator or administrator at the public primary school level of the educational institution who has been designated as such by the Teachers Service Commission and is in charge of carrying out the recommendations of educational policy and best practices such as ICT integration in teaching and learning.

Internet: Is a term used to describe a computer network that enables teachers in primary schools in many parts of the world to share knowledge for use in the teaching and learning process.

Information Communication Technology (ICT): This term represents ICT that is utilized in public primary schools to promote teaching and learning.

Perception:	Explains how teachers in public primary schools perceive the application of ICT to the teaching and learning process.
Public primary school:	A government-sponsored facility where students 7 years of age and older get education through integration of ICT in teaching and learning prior to entering secondary education.
Teacher:	According to the study, a teacher is someone who conveys information, abilities, skills and attitudes to pupils and has completed a recognized pedagogical training program and obtained an official certification in ICT.

ABSTRACT

Information Communication Technology (ICT) usage today permeates every aspect of our lives, including academic activity. The use of ICT in education is spreading swiftly across the globe. ICT is a crucial instrument of the teaching and learning process. This study sought to investigate the influence of ICT in teaching and learning in public primary schools in Kakamega County, Kenya. The specific objectives for the study were to: assess the influence of teacher training in information communication technology on integration of information communication technology in teaching and learning in public primary schools in Kakamega County, determine the influence of the availability of digital devices on integration of information communication technology in teaching and learning in public primary schools in Kakamega County, establish the influence of internet connectivity on integration of information communication technology in teaching and learning in public primary schools in Kakamega County and to examine the influence of teacher perceptions toward ICT on integration of information communication technology in teaching and learning in public primary schools in Kakamega County in Kenya. The study used the Technological Pedagogical Content Knowledge theory. The study used a descriptive survey research design. The target population for the study comprised of 356 public primary schools, 3,204 public primary school teachers, 356 public primary school head teachers and 1 County Director of Education. The sample size of 356 public primary school teachers, 189 public primary school head teachers and 1 County Director of Education were chosen using purposive sampling techniques. The study used Slovin's formulae to compute the sample size. Thus, 546 respondents' responses were gathered using questionnaires and interview schedules for the study. Data was presented using frequency tables, charts and bar graphs. After the instruments were piloted, it was found that the reliability coefficient for head teachers was 0.75 and for teachers was 0.76. Both a quantitative and qualitative analysis of the data was performed. To determine the degree of relationship between teachers' integration of information communication technology and teaching and learning in public primary schools, the Chi-square (X^2) test was utilized. Additionally, the Chi-square (X^2) test was used to assess the strength of the observable relationship between the independent and dependent variables. The significance criterion was Cronbach's alpha (0.05). The study found that majority of public primary school teachers lack ICT training, digital devices and internet connectivity. The study also found that, although teachers in public primary schools had positive perceptions toward integration of ICT in teaching and learning, they were not integrating ICT in teaching and learning due to other constraints. This study is significant because the findings of this study may benefit the Government of Kenya through the Ministry of Education by formulating future policies that will enhance teachers' integration of ICT in teaching and learning. The study may also add to the body of knowledge already available on the influence of teachers' integration of ICT on teaching and learning in primary schools in Kenya. The study recommended that the government should train teachers in ICT integration in the teaching and learning process. The government should also provide digital devices and connect internet to schools. This will improve teacher perceptions toward ICT integration in teaching and learning in primary schools in Kenya.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background to the Study

As a result of the emergence of a knowledge-based economy, the world currently faces greater competition in all areas than ever before. Governments worldwide are working to ensure that their citizens have access to high-quality education (United Nations Educational, Scientific and Cultural Organization, 2013). The UNESCO ICT Competency Framework for Teachers acknowledges the relevance of Information Communication Technology (ICT) in education. It also emphasizes how it guarantees that students are properly prepared for the twenty-first century (Sutter & Kihara, 2019). Globalization and the widespread use of ICT in many sectors of life have enabled the development of a social structure powered by information and supported by technology (Mwalongo, 2011). In regard to this, the popularity of ICT places pressure on educational systems to include technology in teaching and learning. Due to the growth of knowledge, educational institutions, including schools can no longer be avenues where students only learn from teachers or just rely on textbooks for information (Mathipa, 2014). This suggests that to ensure successful, continuous and lifelong learning, schools must encourage the acquisition of knowledge, skills and values through the use of technology.

ICT has revolutionized the education sector and made instructional practices more interactive and productive (Lin et al., 2017). With the right implementation, ICT can be a valuable tool to support and enhance the learning process in educational settings. Teachers' active involvement is essential to ensuring effective integration of ICT in the classroom (Seufert et al., 2021). ICT offers tools that are used in both traditional and online teaching spaces and helps to build proactive classroom environments (Jogezai, 2021). This environment motivates teachers and learners to integrate ICT in teaching and learning. Integrating technology into instructional methods not only improves the quality of learning but also helps students become more skilled, motivated and knowledgeable (Akram & Yang, 2021). During COVID-19 global crisis, ICT supported teaching and learning activities (Thaheem et al., 2021) on one hand and, as a substitute for in-person

instruction, offered a flexible approach and better access to learning opportunities (Akram & Yang, 2021) on the other hand.

Xu et al. (2021) claimed that by fostering students' motivation and raising their level of thoughtfulness, ICT integrated instructional approaches have greatly aided in meeting the educational needs of learners. This has ensured quality education in the learning institutions. Liu (2021) asserted that, students' cognitive understanding and learning outcomes improve when they participate in technology-integrated learning. Additionally, by utilizing a variety of social media platforms, ICT-integrated teaching and learning practices allow students to maintain active class participation, stay in touch with their teachers and peers and assist them in overcoming academic obstacles. Liu (2021) contended that teachers create a collaborative classroom environment through the use of the collaborative concept mapping technique (CCMT), which not only fosters student engagement but also recognizes the value of students' active participation in learning.

Number of factors influences teachers' integration of ICT in teaching and learning. Teachers' attendance of professional development courses in ICT is one of the factors that influence teachers' ICT in teaching and learning. Dussedorf (2016) affirmed that because schools in Germany only had a small budget for them, teachers regularly pay a percentage of the costs of professional development activities. As a result, many teachers miss professional development opportunities. On the other hand, as a reward for taking part in professional development activities, the European Commission (2013) stated that teachers in the Czech Republic had access to 12 paid workdays each academic year. The development strategy of the school also included a plan for the teachers' professional growth. As a result, the Czech Republic's substantial aid programs may have affected initiatives for teacher professional development (European Commission, 2013). Due to this, teachers in Czech are likely to integrate ICT in teaching and learning than those teachers in Germany.

Many countries throughout the world have repeatedly launched initiatives to support teachers in integrating ICT into their lessons (Laaria, 2013; Nyaga, 2014). In order to

meet the demands of the global community, Pakistan has developed programs to improve teachers' integration of ICT in teaching and learning (Pakistan Ministry of Education, 2018). It is envisaged that Pakistan students would be more equipped for the twenty-first century if ICT was integrated into the classroom and curricula (Nyaga, 2014). Despite of these initiatives by the Pakistan Ministry of Education, research in Pakistan indicates that many teachers do not routinely integrate technology into their teaching and learning activities in the classroom due to a variety of challenges, despite the government's expenditures on ICT infrastructure (Cuben, 2011). These challenges include inadequate ICT infrastructure, internet access and electricity (Akram & Yang, 2021); a lack of technological expertise and proficiency (Asad et al., 2020); and a lack of teacher preparation in educational institutions (Abbasi et al., 2021), all of which harm the effective integration of ICT in the classroom. These challenges have negatively the quality of education in Pakistan.

According to the Global Information Technology Report (GITR) 2017–2018 ranking, Singapore is the country with the greatest ICT adoption in education worldwide, as well as the most innovative and digitally advanced (Ghavifekr et al 2019). The report also noted that certain nations in North America, Europe and Asia are leading the way in using ICT to revolutionize their economies. According to Lee et al. (2015) integrating ICT into the classroom has been a major tenet of Singapore's educational system. Thus, the cornerstone of Singapore's educational system is the use of ICTs by teachers, students and school administrators. This implies that, learners in Singapore are receiving quality education because of the use of ICTs in the education system.

In recognizing the value of ICT in education, the government of Malaysia started integrating ICT into the national curriculum for primary and secondary schools in one of its most recent education blueprints, 2013–2025 (Ghavifekr, et al., 2019). In South America, the Government of Peru ordered the purchase of over 600,000 laptops for use by students attending rural primary schools in the nation as well as for future use, setting the groundwork for the implementation of digital literacy projects in classrooms. However, the program faces obstacles related to infrastructure, including electricity and

contemporary buildings as well as teacher computer literacy (Warschauer & Matuchniak, 2010). This has led to lower integration of ICT in the classroom. This has negatively impacted on quality of education offered to the learners.

Ghana is one of the African nations that has created extensive ICT policies and made significant investments intended to advance and improve technology adoption across all industries (Hitachi, 2009). According to Enu et al. (2018) ICT is currently a crucial component of Ghana's education service strategic plan. For instance, Ghana launched the "One Laptop per Child Policy," an intervention program designed to improve instruction and foster students' interest in ICT use. Due to the program, numerous primary schools now have a large number of laptops. This has led higher integration of ICT skills at classroom. This implies that, learners would benefit more from any curriculum if they have computers and laptops.

Tanzania's national ICT strategy's main objective is to use ICT to advance economic and social development across all domains of life. The Tanzanian government has adopted the framework of Technological Pedagogical Content Knowledge (TPACK). This strategy recognizes that ICT can offer novel ideas for raising standards and improving education at all educational levels. The information and communication technology for teacher professional development (ICT-TPD), which is supported by the basic education policy, was developed as a result of this approach (Swarts & Wachira, 2010). Enhancing teachers' ability to incorporate technology into Science, Mathematics and English classes within Tanzania's educational system was the primary goal of ICT-TPD. ICT integration has been used in Tanzania to enhance and upgrade teaching and lifetime learning while assisting in the construction of "a well-educated and learning knowledge society," which entails enhancing basic education access, fairness, quality and relevance (MoEVT, 2015).

Although this background information was relevant to the present study, it should be noted that these studies from other countries may be different because they were conducted in other countries and therefore their findings may not be applicable to the Kenyan situation. However, this background phenomenon created a puzzle that motivated

the researcher to try to understand why some teachers in Kakamega County in Kenya were willing to change their practice while others were hesitant to make integration of ICT in teaching and learning practices. The researcher was further motivated by the fact that the world governments including Kenya are continuing to invest in ICT infrastructure for teaching and learning purposes, while only a handful of schools successfully integrating ICT into their pedagogical practices (Balanskat & Gertsch, 2010).

Kenya is among the Sub-Saharan countries in Africa that have integrated ICT into their educational policies over time (Muinde & Mbataru, 2019). ICT integration in teaching and learning was given a lot of attention in the Kenya National Education Sector Plan (2018–2022). Stakeholder suggestions on how education should change to meet the demands of the twenty-first century for training and education are compiled in Sessional Paper No. 1 of the 2019 policy. Odhiambo (2012) provided a well-articulated report on the integration of ICTs in education, which paved the way for the seasonal paper No. 14 of 2012 on reforming Kenya's education and training sector. All these sessional papers provide a policy framework within which the integration of ICTs or modern tools in teaching and learning is to take place in various regions and areas in Kenya.

The Government of Kenya released the National ICT Policy on Education in 2006, which included, among other things, provisions supporting e-learning and rural electrification programs that connected schools to the national electricity grid (ROK, 2012). According to Mandaku et al (2012) the majority of schools were not effectively integrating and utilizing ICT in teaching and learning. Furthermore, Laaria (2013) found that despite the efforts of numerous stakeholders and the importance of ICT in the education sector, the National ICT Policy on Education of 2006 has not been successfully implemented as intended. Laaria, (2013) adds that, although many nations have claimed adoption rates of above 41% for ICT in teaching and learning in schools, Kenya's rate is still quite low.

All first-graders in public primary schools across Kenya were to receive tablets as a result of the value and recognition of ICT in education in achieving Kenya's development

blueprint, "Vision 2030" (Langat, 2015; Mariga et al., 2017). Subsequently, curriculum reforms were implemented to equip all learners nationwide with the fundamental skills and advanced digital literacy required to thrive in the 21st century (Mulei, 2019). To provide laptops to all 1.2 million first-grade students, the Government of Kenya launched an ambitious project in 2013 (Wanzala & Nyamai, 2018). The program of providing one laptop per child for digital learning was apparently designed to solidify the use of ICT in the classroom.

Wanzala and Nyamai (2018) noted that the policy was changed from laptops to tablets because of the financial implications during the implementation of the one-laptop-per-child program in May 2016. However, of the 23,951 public primary schools that were targeted, by July 2018, 19,000 had received tablets (Abuya, 2019). However, according to a survey conducted by the Kenya Institute of Curriculum Development (KICD, 2016) only a small percentage of public schools were using ICT tools to improve teaching and learning, even though some of them were equipped with technology through the digital literacy program and other sources. This was attributed to teachers' incompetence or resistance to integrating ICT into the teaching and learning process.

The current study concentrated on public primary schools in Kakamega County. In Kakamega County, majority of primary schools are located in rural areas, though a small number are in urban areas. Majority of public primary schools in Kakamega County have large student populations and classrooms are typically full, according to the Kenya National Bureau of Statistics (KNBS, 2018). Regarding the integration of ICT in teaching and learning, the 2018 Kakamega County schools' census report revealed that, although certain schools had ample ICT resources, teachers rarely used technology in the classroom (MoE, 2018). The report expressed concern that Kakamega County's aim of raising educational standards through ICT adoption has been harmed by the widespread use of the traditional teacher-centered lecture method in overcrowded classrooms. To this end, it was imperative to investigate the influence of the integration of ICT in teaching and learning in public primary schools in Kakamega County in Kenya.

1.2 Statement of the Problem

The Government of Kenya Vision 2030 plan places a strong emphasis on ICT integration across the board. The government believed that by integrating ICT into teaching and learning, it would be possible to address issues like lack of trained teachers in ICT and textbooks, lack of digital devices and internet connection in schools, negative perceptions of teachers towards ICT integration in teaching and learning and the transition from content-based to competence-based curricula. However, the penetration rate of ICT integration into the education system in Kenya is still far below the global average of 50% (Sutter & Kihara, 2019). Specifically, it is still unclear to what extent most public primary schools have integrated ICT in their teaching and learning processes. According to the Kakamega County Schools Census Report 2022 majority of public primary schools in Kakamega County have minimal use of technology in teaching and learning, despite having teachers trained in ICT, schools having access to digital devices and internet connection and, teachers having positive perceptions (MoE, 2022).

Furthermore, majority of teachers depend on cyber to complete their ICT-related responsibilities, like submitting their yearly online reports to the Teachers Service Commission (TSC) and conducting examination analysis (County Director of Education report, 2022). It is against this backdrop of lack of trained teachers in ICT and textbooks, lack of digital devices and internet connection in schools, negative perceptions of teachers towards ICT integration in teaching and learning and the transition from content-based to competence-based curricula in Kakamega County, the slow adoption and use of ICT by teachers is likely to jeopardize the intended provision of high-quality education. Moreover, studies conducted on ICT integration in teaching and learning were done in secondary school (Luhombo, 2022). However, because these studies were all focused on secondary schools in various counties in Kenya, there are contextual differences that make it impossible to generalize the findings to public primary schools in Kakamega County. Therefore, this justifies the selection for this study location in order to investigate the influence of integration ICT in teaching and learning in public primary schools in Kakamega County in order to fill the knowledge gaps.

1.3 General Objective of the Study

The general objective of this study was to investigate the influence of integration of information communication technology in teaching and learning in public primary schools in Kakamega County in Kenya.

1.3.1 Specific Objectives of the Study

The study was guided by the following specific objectives:

i. To assess the influence of teacher training in information communication technology on integration of information communication technology in teaching and learning in public primary schools in Kakamega County, Kenya.
ii. To determine the influence of the availability of digital devices on integration of information communication technology in teaching and learning in public primary schools in Kakamega County, Kenya.
iii. To establish the influence of internet connectivity on integration of information communication technology in teaching and learning in public primary schools in Kakamega County, Kenya.
iv. To examine the influence of teacher perceptions toward information communication technology on integration of information communication technology in teaching and learning in public primary schools in Kakamega County, Kenya.

1.4 Research Questions

i. What influence does teacher training in information communication technology has on how information communication technology is integrated into teaching and learning in public primary schools in Kakamega County?
ii. How does teachers' integration of information communication technology in teaching and learning in public primary schools in Kakamega County depend on the availability of digital devices?
iii. What influence does internet connectivity have on teachers' integration of information communication technology in teaching and learning in public primary schools in Kakamega County?

iv. What is the influence of teacher perceptions toward information communication technology on integration of information communication technology in teaching and learning in public primary schools in Kakamega County?

1.5 Significance of the Study

The findings of this study could benefit the Ministry of Education by formulating future policies that will enhance teachers' integration of ICT in teaching and learning. Planners and policymakers are anticipated to use the study's findings as a basis for revamping the nation's present ICT strategy to address the problems impeding teachers in Kenya's primary schools from seamlessly integrating ICT in teaching and learning. The Ministry of Education may use the findings of this study to develop in-service education training (INSET) programs for primary school teachers. The recommendations provided could assist primary school teachers and administrators in promoting ICT integration in the classroom. This could have an impact on how curricula are created and how higher learning institutions address the need to offer ICT courses to teachers that satisfy the need for them to be able to adapt to the quickly changing digital environment. The findings of this study could be used to educate primary school teachers on how to integrate ICT in the teaching and learning process in a way that is in line with the MDGs and Vision 2030. Additionally, since primary school teachers are mainly responsible for implementing curricula, the study's findings can be useful in assisting them in reevaluating their instructional strategies and making the necessary adjustments. It is predicted that the study's findings will suggest new areas of inquiry for scholars and researchers, which will benefit the overall field. The research may add to the body of knowledge already available on the influence of ICT use by teachers in primary schools in Kenya.

1.6 Limitations of the Study

The participants' concern that their identity may be exposed and the information gathered might be used against them may have limited the study's scope. To ease this restriction, the researcher informed the respondents that their names would remain anonymous and that the data collected would only be used for the study. To achieve this, the respondents were asked not to write their names on the questionnaires. Additionally, the researcher

likely had little influence over the opinions of the respondents. Some of them may have been uncooperative and may have given responses to appease the researcher. This might have affected the study's validity. In order to overcome this constraint, the researcher assured the respondents that, their opinions would be treated honestly. Additionally, because private primary schools were left out of the study, it was inept to extrapolate the findings to all primary schools, which may have constituted another constraint. In order to address this, the researcher has suggested that additional, similar investigations be carried out at private primary schools.

1.7 Delimitations of the Study

The study only focused on factors that influence the teachers' integration of ICT in teaching and learning in public primary schools in Kakamega County. These variables were measured in terms of study objectives touching on: teachers training in ICT, availability of digital devices in public primary schools, availability of internet connectivity in public primary schools and teachers' perceptions toward integration of ICT in teaching and learning in public primary schools. The study dealt with one region, Kakamega County and therefore the data generated should be interpreted with caution when generalizing the results to the entire country especially private schools and areas with well-developed ICT systems in place. The sample of the study was drawn from both public primary boarding and day schools in Kakamega County. The County Director of Education, primary school head teachers and primary school teachers in both public primary boarding and day schools formed the study sample. Questionnaires and interview schedules were used as data-collecting instruments. Further, the study used a descriptive survey design to analyze its data.

1.8 Assumptions of the Study

The study's underlying assumption was that all primary school teachers in Kakamega County had undergone ICT training to integrate it in teaching and learning. The study acknowledges that, effective ICT integration in teaching and learning requires access to digital devices and the internet. The study presupposed that public primary schools in Kakamega County had appropriate and acceptable digital devices and enough

internet connection to integrate ICT into teaching and learning. The study also assumed that all primary school teachers in Kakamega County are in favor of integrating ICT in the classroom.

1.9 Organization of the Study

The study is organized into six chapters. Chapter one of the study includes the study's background, statement of the problem, general and specific study objectives, research questions, significance of the study, limitations of the study, delimitation of the study, assumptions of the study and definitions of key terms. In chapter two, a review of the literature is provided and is based on the sub-themes of the study objectives. It focuses on issues such as teacher training in ICT, availability of digital devices in public primary schools, internet connectivity in schools and teacher perceptions toward ICT integration. Additionally, included is the summary of the literature review, the theoretical framework and the conceptual framework.

The study's methodology is covered in chapter three. The chapter covers research design, target population, sampling techniques and sample size, research instruments, validity and reliability of the instruments, data collecting procedures, data analysis and ethical issues. The fourth chapter deals with data presentation and analysis based on study's objectives. Response rate, demographic information about the respondents, teacher training in ICT and ICT integration in teaching and learning in schools, availability of digital devices and ICT integration in teaching and learning and availability of internet connectivity and ICT integration in teaching and learning in schools and teacher perceptions toward ICT and integration of ICT in teaching and learning in primary school are all discussed in this chapter.

Chapter five discusses and interprets the research findings based on data collected using a descriptive survey design. The theoretical and conceptual framework discussed in chapter two guides the discussion and interpretation of the data. The variables of the study's objectives that are discussed include teachers' training in ICT, the availability of digital devices in public primary schools, the availability of internet connectivity in public

primary schools and teacher perceptions toward ICT integration in teaching and learning in public primary schools. The sixth chapter presents conclusions and recommendations of the study. The chapter provides conclusions of the results based on teacher training and ICT integration in public primary schools, the availability of digital devices and ICT integration in public primary schools, the availability of internet connectivity and ICT integration in public primary schools and, teacher perceptions toward ICT and integration of ICT in teaching and learning in primary schools. The chapter also provides suggestions for further studies.

CHAPTER TWO

2.0 REVIEW OF RELATED LITERATURE

2.1 Introduction

This chapter provides a summary of the literature review relevant to the study on ICT integration in teaching and learning in schools. The chapter focuses on study reports from various countries that integrate ICT in education. This chapter discusses teacher training in ICT and integration of ICT, availability of digital devices in schools and integration of ICT, availability of internet connectivity and the integration of ICT in schools and, teachers' perceptions toward ICT integration and integration of ICT in teaching and learning in schools. Along with a summary of the literature review, a theoretical framework and a conceptual framework are all explored.

2.2 Teacher Training in ICT and Integration of ICT in Teaching and Learning

ICT teacher preparation is a big concern for educational institutions as well as the general public. There is a strong correlation between teacher training in ICT and the level of ICT integration in teaching and learning. Teachers must first complete extensive training before they can accept ICTs (Jasmansyah et al., 2022). Sulemana et al. (2018) claimed that ICT can be a powerful tool in the classroom when properly utilized by qualified teachers. ICT makes teaching and learning more effective by motivating students more. For instance, using ICT in the classroom can make it easier to explain difficult words and concepts.

ICT training for teachers has grown in importance within the educational system. Since teachers are the backbone of the educational system, it is their duty to use ICT to its fullest potential in both teaching and learning (Tekya & Asare, 2016). According to Bhattacharjee and Deb (2016) for ICT to be effectively integrated in teaching and learning, teachers need to be able to set up their classrooms so that technology can be used in unconventional ways. Therefore, a teacher's inexperience with technology will limit their creativity and confidence when it comes to integrating it into their lessons.

Furthermore, Kamaruddin et al. (2017) asserted that teachers' familiarity with and proficiency with ICTs will determine their ability to integrate technology into lessons and recognize its value as a versatile teaching and learning tool. This suggests that increasing teachers' ICT proficiency through ongoing practice is an essential precondition for successfully integrating ICT into the classroom. With the world growing more digital and virtual learning becoming more common, teachers need to be prepared to use technology to share necessary knowledge. It makes sense that the issue of teachers' ICT training levels has drawn the attention of numerous researchers worldwide.

The study conducted by Nurhabibah et al. (2018) examined the ICT literacy competency of vocational high school teachers in Indonesia. The study used descriptive method with literature study and documentation technique. The study found that: teachers lacked confidence in their ability to use ICT; male teachers had higher ICT literacy than female teachers; there were differences in ICT literacy levels between age groups and educational levels; teachers in the age group of 21 to 40, who were relatively younger, had higher ICT literacy than teachers in the older group; and teachers in the lower education group had lower ICT literacy levels. This implies that gender and age play a significant role in ICT literacy and use. Gender and age factors may play a significant role in Kenya and in particularly in Kakamega County, where majority of public primary school teachers are female and 40 years of age or older (KNBS, 2022). This raises an inquiry: Could the slow adoption of technology in Kenyan public primary schools particularly in Kakamega County be related to the fact that most teachers are middle-aged and older and female? The Nurhabibah et al. (2018) study was limited in that it was conducted in secondary schools in Indonesia, so their findings could not be applied to Kenyan contexts. The current study was conducted in public primary schools in Kakamega County in Kenya.

Ghavifekr and Rosdy (2015) did a study on the effectiveness of ICT integration in public secondary schools in Malaysia. A descriptive survey design was used for the investigation. 101 randomly selected teachers from 10 public secondary schools received survey questionnaires. The study's findings showed that ICT integration was quite

successful for teachers and students alike. The results of the study also demonstrated that teachers had ready access to ICT resources. This helped technology-based education succeed. It was also shown that boosting teachers' professional development was essential for enhancing children's academic performance. However, because this study used questionnaires and stratified sampling techniques to collect data, the validity and reliability of the study might have been affected by this. The current study used questionnaires and interview schedules to collect data in public primary schools in Kakamega County in Kenya in order to bridge this gap.

Studies however have revealed that, few teachers actually took in-service ICT courses, and those that they did attend, lacked pedagogical component. Orztuk and Anal (2012) examined the difficulties teachers encounter when incorporating ICT in teaching and learning in Turkey. Only 6 of the total 18 teachers obtained in-service ICT training, according to the study's findings. The study also found that the lack of pedagogical components in the ICT training made the six teachers ineffective and made it challenging for them to incorporate ICT into their teaching and learning. The study recommended including a pedagogical component in ICT training programs. The results of this study, however, cannot be extrapolated to the full target group due to its small sample size. The sample frame utilized in the present investigation, which included 546 respondents, was sufficiently large to overcome this restriction.

Mehari et-al. (2020) did a study on teachers' capacities to integrate ICT in teaching and learning Biology in secondary schools in the Southern Region of Eritrea. A descriptive survey research design was used for the investigation. Using simple random and stratified sampling techniques, 12 secondary schools from 12 Sub Counties were selected. 175 pupils in grade eleven, 34 biology teachers and 12 administrators all took part in the study. Data was gathered using questionnaires, interview schedules and observation schedules. The study found that, majority of biology teachers lacked the essential skills and formal training to integrate ICT into their practices of teaching and learning. They had also received inadequate training in computer literacy. There was therefore limited ICT integration in Biology teaching and learning. According to the study, to guarantee

that all pre-service teachers leave the institution with a comparable level of ICT proficiency, teacher-training institutions should incorporate computer instruction and training on how to integrate ICT into the curriculum. The findings of the study, however, cannot be extensively applicable to the situation in Kenya because they were carried out in the Southern Region of Eritrea and had a primarily biological focus. The current investigation was carried out in public primary schools in Kakamega County in Kenya to get over this limitation.

Owalabi (2013) conducted a study on teacher preparation, ICT prospects and the difficulties of the e-teaching profession in Nigeria. A descriptive survey design and observation schedule were used to gather data for the study. Less than 10% of teachers in primary and secondary schools in Nigeria had computer training, according to the study's findings. This fundamental issue prevented ICTs from being effectively integrated into the teaching and learning process in schools. The study recommended teachers to take part in ICT training programs to integrate ICT into their teaching and learning processes. This study's findings might not apply to the situation in Kenya because it was carried out in Nigeria. Another limitation of the study was that it only used an observation schedule to collect data. The validity of the results may have been harmed by this. To fill these gaps, the present investigation was conducted in Kakamega County in Kenya, utilizing questionnaires and interview schedules to collect data.

Jean and Arcand (2010) conducted a study on teachers' attitudes about ICT for teaching, professional development, administration and personal use in Tanzania. Data were gathered using questionnaire responses from 74 teachers and purposive sampling technique. The study found that, ICT training for teachers had improved their self-confidence and ability to instruct young people in Tanzania. The study recommended that future research should focus on classroom observations to ascertain the actual use of ICT in the teaching and learning process. The fact that this study was carried out in Tanzania precludes extrapolating its findings to a Kenyan context. A small sample of 74 respondents and only questionnaire and purposive sampling procedures were utilized in the study. The minimal amount of data that was gathered may have affected the validity

of the findings. In order to fill these gaps, the present study collected data from 546 respondents using a questionnaire and an interview schedule.

Mwunda and Ogutu (2018) investigated the elements affecting the usage of ICT in teaching and learning in public secondary schools in Nakuru County, Kenya. A descriptive survey design was used. The study's findings showed that secondary schools in Nakuru County were still lagging behind in their use of ICT in the teaching and learning process. One of the major factors contributing to this condition was the lack of ICT teacher training, among other reasons. The study recommended that, funding be made available to purchase infrastructure and provide training sessions to address the readiness of teachers to incorporate ICTs. However, the study focused on secondary schools in Nakuru County and therefore, its findings cannot be generalized to public primary schools in Kakamega County. The present study was conducted in public primary schools in Kakamega County in order to fill this gap.

Mbithe (2016) looked into what influences teachers' integration of ICT in teaching and learning in public secondary schools in Machakos Sub County. The study used questionnaire to collect data from 70 head teachers and 1053 teachers from 70 public secondary schools from Machakos Sub County. The study found that, among other things, most head teachers and teachers possessed rudimentary ICT literacy. ICT was, nevertheless, only partially incorporated into teaching and learning by head teachers and teachers. Furthermore, even though it was found that many secondary schools had constructed computer labs, there was a significant discrepancy between the quantity of students and the quantity of computers. Additionally, the study found a weakly positive relationship ($r = 0.366$, $p < 0.001$) between teacher ICT competency and ICT integration. However, because Mbithe's (2016) study only used questionnaire as a data collection tool, the validity and reliability of the findings might have been affected. Moreover, the study targeted secondary schools whose financial base is most often better than primary schools. The present study used questionnaire and interview schedules to collect data from participants in public primary schools in Kakamega County in order to fill these gaps.

2.3 Availability of Digital Devices and Teachers' ICT Integration in Teaching and Learning

Integration of ICT in teaching and learning goes beyond the use of computers in a classroom. It includes other resources such as Television programmes, Radio programmes, e-learning programmes, DVDs and CDs. Other resources include Smart phones, Projectors, Laptops, Tablets and Wiki blogs (Nuhu & Onojah, 2021). These digital devices are broadly divided two groups; hard ware and software. The software digital devices are categorized into nine groups. These include: searching tools such as e-library and google scholar, collaborative tools which include: Telegram, WhatsApp and Google Doc, virtual conferencing tools such as Zoom, Google Meet, WebEx, Microsoft teams, Google Hangouts, Skype, Meta platform (Facebook live) and You Tube live, learning management systems like Kenya education cloud (KWC-LMS) platform, google classroom Moodle and Edmodo, meeting tools such as Attendify and Calendar, assessment tools like E-portfolios, E-gaming, E-forms and digital rubrics, creating or multimedia resources like recording, editing, Wikis and Podcasting, Storage tools such as google drive, one drive and drop box and, social networks in learning like Twitter Instagram, Facebook, WhatsApp. These tools form a repertoire of modern technologies that enhance efficient transformation, transforming people's information retrieval capabilities and shaping their interpersonal engagement.

The successful integration of ICT into teaching and learning requires schools to possess a sufficient and appropriate number of digital devices. The accessibility and availability of ICT resources, such as hardware, software and communication infrastructure, are critical to the success of technology integration in schools. Abuya (2019) highlighted that the successful integration of ICT in schools requires the provision of modern ICT infrastructure and teachers who are digitally literate. The advancement of educational initiatives and policies now requires the integration of digital devices as a necessary precondition. Teachers can improve their digital competencies and the teaching and learning process through dynamic and innovative approaches by using digital tools that provide them with comprehensive training. As such, the integration of digital devices into educational activities improves their efficacy.

Empirical data from a number of studies have demonstrated the direct impact of digital tools on teachers' ICT integration. Due to this mindset, world government have invested immensely in provision of digital tools in schools. In the United States, ICT technology was utilized in schools considerably more frequently than in other countries. From 2005 to 2015, there were fewer students per computer that is from 63:1 to 6:1 (Market Data Retrieval, 2016). Teachers in developed nations are therefore better able to integrate ICT into their teaching and learning.

Ran Peng et al. (2023) examined the factors influencing Chinese in-service teachers' ICT integration. A quantitative approach was taken in the study. Snowball sampling was used to gather information from 685 in-service teachers. Partial squares structural equation modeling (PLS-SEM) was used to analyze the data. The study found that the use of digital tools affected the integration of ICT in teaching and learning, among other things. Further, the study found that teachers between the ages of 31 and 35 had stronger digital skills, used digital tools and integrated ICT more than teachers who were younger or older. Additionally, female teachers demonstrated higher levels of positive attitudes and digital competence than male teachers did. Additionally, compared to teachers with more than ten years of experience, those with less than three years of experience demonstrated considerably stronger attitudes, self-efficacy, digital competence, and ICT integration. However, since this study was carried out in China, it is not possible to extrapolate its findings to the circumstances in Kenya. The present study investigated on integration of ICT in teaching and learning in public primary schools in Kakamega County in Kenya to fill this gap.

Albirin (2016) conducted a quantitative study on computer attributes, cultural perspectives, computer competency, computer access and personal characteristics for The Case of Syrian EFL Teachers. Respondents to the study included 251 female and 63 male teachers. The results showed that 57.6% of respondents had computers at home, compared to 33.4 percent of respondents who had access to computers at school. This illustrated how limited access to computers was for teachers. However, because this study was conducted on Syrian EFL teachers, it is not possible to extrapolate its results to a

Kenyan context. The present investigation was carried out in Kenyan public primary schools.

Simin et al. (2022) did a study on ICT integration in education in primary schools in Malaysia. The study used a sample of 61 teachers from 10 public primary school teachers, who took part in the quantitative study's survey. The study found that majority of teachers frequently used ICT, although the majority preferred using it for administrative duties above classroom teaching and learning. The findings also indicated that primary schools lacked an adequate computer infrastructure. The report recommended that teachers should have proper access to computers. This would support the idea that providing students with access to ICT-based learning opportunities will raise the standard of their education. The results of this study, however, cannot be applied to the situation in Kenya because it was carried out in Malaysia. The study also used a small sample size of 61 teachers. This might have affected the validity and reliability of the results. The present study was conducted in public primary schools in Kakamega County in Kenya. The study collected data from a sample population of 546 participants.

The integration of ICT in teaching and learning in Africa has also been impacted by a shortage of suitable and sufficient digital devices. Amuchie (2015) looked into how much ICT was used for teaching and learning in Nigerian secondary schools. 264 principals and teachers were chosen as a sample using the stratified random sampling technique. A Likert scale questionnaire was created by the researcher and used. The results of the study indicated that there was very little use and availability of ICT resources. Majority of teachers rated the availability of most ICT infrastructure, including desktop computers (75.0%), laptops (100.0%), televisions (94.6%), video players (98.2%), digital cameras (100.0%), interactive white boards (100.0%), multimedia projectors (100.0%) and others, as extremely poor. It was also found that several issues, including inadequate power supplies, a shortage of skilled workers and the exorbitant cost of computers and accessories, prevented people from using ICT. However, this study was limited because the only tool that was used to collect data was a questionnaire. This might have affected the validity and reliability of the results. The present study used questionnaires and

interview schedules to gather information from the participants in Kakamega County in Kenya.

Nwana et al. (2017) looked into the availability and use of ICT resources by Ghanaian secondary school teachers for computer education instruction. To gather data from the respondents, the study used a 40-item questionnaire for a sample of 300 computer teachers. The results showed that there were insufficient ICT teaching resources. It was also found that teachers were not utilizing some ICT resources, even though they were available. As reported by 94.0 percent of teachers, the most readily available materials were computers, followed by audio and video discs (83.3%), scanners (83.3%), printers (87.0%), flash memories (82.0%), and printers (83.3%). The following materials were in short supply: electronic white board (4.0%), multimedia projector (5.3%), e-graphics (3.0 %), power bank devices (8.0 %) and programmed instructional materials (6.0 %). The study was limited in that, it was conducted in secondary schools in Ghana and therefore its findings may not be generalized to Kenya situation. The present study was conducted in public primary schools in Kakamega County in Kenya.

The study conducted by Sibanda et al. (2016) investigated the factors that prevented the integration of ICT resources in schools in Zimbabwe. Projectors, email, e-learning apps, networks, wireless technologies, computers, TVs, radios, interactive boards, email, and video conferencing were a few of the technologies that were evaluated. The study used mixed methods research design, purposive sampling techniques, questionnaires and interview schedules to collect data from 163 teachers and 9 principals. Most ICTs, including computers, interactive whiteboards and projectors, were found to be insufficient by the research. The study also found that there were not many ICTs available either. ICT utilization in these schools is hampered by several factors, including inadequate resources, a fear of technology, a lack of ICT skills, a lack of power supply, a lack of interest, and a poor physical ICT infrastructure. The study recommended that in order to encourage teachers to use technology, schools should provide regular training and ICT skill upgrades, install backup power sources like solar and generators, and hire staff to handle critical technical support. This study's gap was that it was carried out in

Zimbabwe and therefore its findings may not be applied to a situation in Kenya. The present study was conducted in public primary schools in Kakamega County in Kenya.

Ndidde et al. (2016) did a presentation on technology and education: ICT in Ugandan teacher training colleges. The study used qualitative case study methods on ICT infrastructure assessment in 11 teacher training colleges in Uganda. Stratified random sampling and was used to identify 7 teacher training colleges initially; 4 additional colleges were purposefully sampled based on their high levels of ICT Data for the study was collected using observation and interview schedules. Ndidde et-al. (2016) reported that, despite institutions' best efforts to provide the necessary infrastructure and equipment, the ratio of students to computers in Ugandan educational institutions remained high. All institutions obliged teachers in particular to share computers with students, except one tertiary institution where all lecturers had access to computers in their offices. This made it more difficult to incorporate ICT into teaching and learning in educational institutions. However, because these investigations were conducted in Ugandan teacher training institutions, it may not be possible to extrapolate the results to the situation in Kenya. The present study investigated on integration of information communication technology in teaching and learning in public primary schools in Kakamega County in Kenya.

Obota et al. (2015) evaluated the ICT infrastructure that is available in public secondary schools located in Mumias Sub-County, Kakamega County, Kenya. The study used a descriptive survey design. The target population for the study comprised head teachers, teachers and student in public secondary schools in Mumias Sub County. Stratified and simple random sampling techniques were used to sample schools while Kathuri and Pals formulae was used to determine the sample size for the students. Questionnaires and structured interview schedule and content analysis were study used to collect data. Data was analysed descriptively. The study found that the two most common ICT facilities were radios and computers. Nevertheless, the available radios were inadequate and the average computer-to-learner ratio was 30:1. The study recommended that the Ministry of Education should hasten the development of ICT policy to ensure that teachers practice

what is in line with ministry's expectations. The study also recommended that schools should involve governing bodies to facilitated provision of ICT infrastructure. However, this study had a limitation in that it was carried out in secondary schools in Mumias Sub County. The present study was carried out in public primary schools in Kakamega County.

Murithi and Jin (2021) looked into how teachers in public primary schools used technology to develop competency-based curricula in Kenya. The study gathered data from 351 teachers using an online survey. The study found that school ICT infrastructure was deficient. This made it difficult to integrate technology into the competency-based program. The study recommended that, in order to enable schools to purchase ICT equipment, the government should enhance financing for public primary schools. However, this study only used an online questionnaire to collect. This might have affected the validity and reliability of the results. The present study used interview schedules and questionnaires to collect data from respondents in public primary schools in Kakamega County in Kenya.

Nokiri et al. (2021) conducted a study on the effects of integrating ICT infrastructure in teaching and learning in secondary schools in Meru County, Kenya. The study used descriptive survey design. The study surveyed 276 respondents, encompassing 216 form three students, 48 teachers, 12 secondary school principals and 12 secondary schools, using simple random sampling, questionnaires, interview schedules and observation schedules. The study found that, there was minimal investment in ICT infrastructure because of the high cost of computer hardware and software. The study's use of secondary schools in Meru County, however, limited its applicability. As a result, its findings cannot be used to describe the conditions in the primary schools of Kakamega County. The present study was carried out in Kakamega County and investigated teachers' integration of ICT in teaching and learning in public primary schools in Kakamega County in Kenya.

Sanja's (2014) study focused on information and communication technologies in primary schools in Kenya. The study involved 50 head teachers from both private and public primary schools and data was acquired through scheduled interviews. The study's findings revealed that each of the participating schools only had a few computers with a wide variety of application software installed at random, including word processing, database, spreadsheet and presentation software. In addition to these ICTs, there were also telephones, mobile phones, radios and televisions available in the classrooms. The study also showed that teachers mostly used the staffroom to use computers, whereas pupils in private (academy) schools used the computer labs. The research recommended that the public primary school stakeholders act fast to put ICT infrastructure in place in all primary schools. However, the information gained was limited by the study's dependence on interviews as a method of data collecting. This might have affected the validity and reliability of the results. The present study used questionnaire and interview schedules to collect from the respondents in Kakamega County in Kenya. This ensured the validity and the reliability of the results.

2.4 Availability of Internet Connectivity and Teachers' ICT integration in Teaching and Learning

The best way to integrate ICT into classroom teaching and learning is through the usage of the internet. Technology-based learning, often known as computer-based learning and teaching was developed to boost student interest and effectiveness. Internet has the ability to drastically change professional education (Olwafemi, 2016). Due to the growth of internet services, the traditional methods of information dissemination through leaflets and other printouts are becoming obsolete. The internet has improved access to education. It is the best medium for programs including distance learning. Students can receive tutoring, consultations and course offerings online. The learning materials are accessible for download, the educational program is delivered by email and regular evaluation is carried out. Due to these significant uses, majority of schools should have internet access, which has an impact on how teachers in schools integrate ICT into their lessons. The academic standards of students are also impacted by their access to the internet. Research has shown that, those students who have internet connection perform

better than those who do not. However, different internet usage has minimal effect on academic achievement. Having multiple sources of internet connectivity does not ensure that you can instantly access them all. In order to give management assistance for internet infrastructure, the heads of institutions should network with other stakeholders. Additionally, teachers should teach students how to use search engines like Google to find online academic resources and school ICT laboratories be fully furnished with internet access to support students' academic endeavors.

Schools in industrialized nations have far greater internet connectivity than those in developing nations. In the USA, schools are becoming more and more online. The proportion of schools with internet connectivity increased from 35% to 72% in 2014. (QED Educational Technology Trends, 2012). In Contrary, although some studies have reported that the availability of the internet in developed countries is not an issue, reports from other studies have shown that internet access is still a challenge in many countries, despite the fact that it influences teachers' integration of ICT in teaching and learning in schools. This has made it more difficult for teachers to incorporate ICT into their lessons. According to British Educational Suppliers Association (2011) report, only 43% of schools had internet connectivity. More than 80% of primary schools in Europe were located in Slovenia in United Kingdom.

Sekiguchi (2011) did research on a case study of how education changed in Japan's information society. The target population of the study was 5,269 students and a sample of 1,053 out of which 724 responded to the questionnaire which comprised of 496 male and 228 female students. Data for the study was analyzed using descriptive and inferential statistics (t-test). The study found that only 10% of the schools had internet access. This was a very low percentage and it could be said that, it was one of the biggest obstacles to teachers using ICT in classroom instruction. The findings of the study, however, cannot be extrapolated to the situation in Kenya because it was conducted in Japan. The present study investigated teachers' integration of ICT in teaching and learning in public primary schools in Kakamega County in Kenya.

Oghenetega and Mercy (2014) carried out research on how internet use affects students' academic performance in tertiary institutions in Benin. The study used a descriptive survey design. A questionnaire was used for gathering the data. A basic percentage and frequency count were used to analyze the data. The study population consisted of 600 students from the Delta State Polytechnic in Otefe, the Abraka Western Delta University in Oghera, The Delta State University in Oghera and the University of Benin in Benin City. The study found that, a large proportion of survey respondents were experienced computer users who routinely visited cybercafés to access the internet. The most popular online materials used by students were e-books and journals and most students gave internet academic activities an average evaluation. Students may also have internet access to pertinent academic resources. The study also found that the internet had improved students' preparation for the exam. Additionally, it was found that, there were a number of issues preventing effective internet access in higher educational institutions in Nigeria. This included power outages, slow internet connections, a shortage of computer terminals, information overload brought on by too many hits and a lack of computers.

The survey recommended that, as a backup in case of a power outage, tertiary institutions should purchase strong generators. Cyber management needs to understand that, opening such and performing effective maintenance both require significant investment. Cybercafés should be equipped with wireless connection points so that students can explore the establishments and have had had better access to information, especially that which is necessary to raise academic performance. In order to ensure that students can satisfy their information demands, tertiary institutions should ensure that each of their individual libraries has enough internet connectivity. However, because this study was conducted in Nigeria and in tertiary institutions, its findings cannot be applied to the situation in Kenya. The study also used only a questionnaire to collect data. This may have had an effect on the validity and reliability of the results. The present study used questionnaires and interview schedules to collect data from 546 participants in public primary schools in Kakamega County in Kenya.

Bukky et al. (2013) investigated on internet usage of first-year students at Uwolowo University in Ile-Ife, Nigeria. A stratified sampling technique was utilized to distribute 1000 questionnaires in order to select the respondents. The results showed a sizable portion of the internet. The study also found that an internet café was their access point. Though access to the internet was available to students, they were still unable to use it at the university library. The report recommended that students set up internet access points. The study also recommended that, the university library should keep working to secure sufficient financing from donors and the government in order to permit students to access the internet at the library and incorporate it in its course on library education. However, because this study was carried out at a university in Nigeria, its findings may not be applicable to the situation in Kenya. A questionnaire was also utilized in the study as the only tool to collect. This might have affected the validity and reliability of the results. The present study was carried out in public primary schools in Kenya. Data were gathered for this study using questionnaires and interviewing techniques.

Frank et al. (2011) conducted a study on the use of computers and the internet as supplemental sources of educational resources in junior and senior high schools in Tema city in Ghana. To collect data, the study used both qualitative and quantitative research designs with stratified sampling technique. The results of the research showed that, majority of Ghanaian schools had internet access. Less than 15% of teachers used the internet in creative ways to enhance teaching and learning. More than 30% of the teachers, according to the report, used computers as their main research instrument. Less than 25% of the students used it for learning and research, compared to less than 40% who used it for entertainment. Additionally, it was found that using computers and the internet has simplified finding answers to questions, finishing tasks and learning about the histories of various cultures. In order to encourage teachers to use of ICT in the teaching and learning process, the study recommended that schools be connected to the internet. The findings of this study, however, may not be applicable to the situation in Kenya because it was carried out in Junior and high schools in Ghana. The present investigation was carried out in public primary schools in Kenya.

Musa (2018) conducted research on the availability and use of the internet for teaching and learning at two distinct teacher-training institutions in Tanzania. The research methodology combined qualitative and quantitative methods. The study sample comprised of 99 participants from Changu and Chako Teachers Colleges, two government-selected teacher education colleges in Tanzania's mainland, one college principal was included in the sample sizes (because the other principle was unavailable), two ICT system administrators, sixteen tutors and 80 student teachers. While tutors and student teachers were selected using stratified and simple random sampling techniques, the principal and ICT administrators were purposively chosen. Data were gathered from tutors and student teachers using questionnaires. An interview guide was used to gather data from college principals and ICT system administrators. The study's findings showed that, most participants used the internet for academic purposes. This was followed by those who use it for searching news. An average amount of respondents used the internet for communication, while slightly more than half used it for gaming. A very small percentage of teachers used social networks on the internet. The research concluded that by ensuring that there is easy access to ICT facilities that provide internet services, the Ministry of Education and Vocational Training, in collaboration with college principals, should promote internet access and use of teacher colleges. However, this study was conducted in teacher training colleges in Tanzania mainland and therefore, its findings cannot be generalized to the Kenya situation. The present study was carried out in public primary schools in Kakamega County in Kenya.

Miima (2016) investigated the use of ICTs in teaching and learning Kiswahili in public secondary schools in Kakamega County in Kenya. The study used descriptive survey design. 45 teachers were selected for the sample size for the study. Questionnaires and interview protocols were used to collect the data for the study. Descriptive statistical techniques were used to analyze the data. The study found that most secondary schools lacked suitable network infrastructure and connections. Although a small number of schools had direct access to high-speed internet connectivity through an internet service provider. The survey also found that natural telecommunications infrastructure had a limited penetration into rural and low-income communities. As a result, there was little

access to high-speed e-mail and internet connectivity as well as dedicated phone lines. Despite being conducted in Kakamega County in Kenya, the study was restricted to the use of ICTs in teaching and learning the Kiswahili language in secondary schools. The present study generally investigated on integration of information communication technology in teaching and learning in public primary schools in Kakamega County.

2.5 Teacher Perceptions and ICT Integration in Teaching and Learning

The adoption of new technology in educational settings is largely determined by the perceptions of teachers. Positive ICT perceptions are anticipated to encourage ICT integration in the classroom (Ovan et al., 2014). Van et al. (2011) asserted that teachers' motivation, behavior and way of thinking are all influenced by their perceptions. Therefore, the degree of effort teachers will put into a task, the length of time they will persevere when faced with challenges and the way they handle technological emergencies are all influenced by the strength of their attitudes. Thus, according to Khochen and Radford (2012) perception refers to entirety of a person's feelings and interests, prejudice or bias, anxieties, preconceived conceptions, threats, ideals and convictions regarding a particular subject. Therefore, perception can be defined as an individual's desire that influences how they respond, whether positively or negatively, to a situation, object, or proposition.

According to Coles and Scior (2012) perception can also be defined as a systematic and consistent way of feeling, thinking and responding to people, groups or any kind of event. Attitude greatly influences perception and although the terms are distinct, they are frequently used interchangeably. Although attitudes and perceptions can be used interchangeably at times, attitudes frequently have an impact on perceptions, which are more expansive. Wasike (2018) argued that perception is the process through which people arrange and interpret their sensory impressions in order to give their surroundings meaning. It is affected by the attitude of the perceiver, which can lean either positively or negatively.

Teachers' perceptions regarding technology have an influence on their willingness to accept its value and application in both teaching and learning. Teachers may readily offer helpful insight about the adoption and integration of ICT in teaching and learning and vice versa if they have a positive mindset toward technology and the usage of educational technology. Teachers' perspectives should therefore be taken into account by educators as one of the variables affecting them in integration of ICT in teaching and learning. Ertmer (2012) noted that, it might be useful to look at teachers' practices and attitudes when determining why they are unable to use ICTs effectively in the classroom.

Kusano et al. (2013) investigated the attitudes of primary school teachers in the United States and Japan regarding the integration of ICT. Their study was supported by the fact that, despite several studies on teachers' attitudes toward ICT, no international comparisons had been conducted. Teachers from primary schools in Hokkaido, northern Japan and Southern Utah, USA, made up the study's participants. The technology acceptance model (TAM) was used to determine the teachers' perceived utility (PE), perceived ease of use and usability (PEUU) and attitudes toward using technology (AT). Although the study showed that Japan availed fewer ICT resources in public education than USA, it is noteworthy that both economies are developed and technology environment may be quite different from Kenya. The present study was carried out in public primary schools in Kakamega County in Kenya which is a developing country.

Beri and Sharma (2019) examined the attitudes of teachers toward the use of ICT among teacher educators in different teacher-training colleges in the Indian state of Haryana. The study used questionnaires and interview schedules to collect data from 207 tutor from 22 teacher training colleges. The majority of tutors had positive perceptions about the use of ICT in teacher preparation. However, it was found that teacher educators lacked technical support and training and that is why the majority of them experienced some anxiety when using ICT tools and devices in the classroom. It also turned out that, despite their belief that using ICT could benefit students more teachers were less passionate and demotivated when it came to using ICT in teacher training due to a lack of self-efficacy. While Beri and Sharma (2019) investigated the attitudes of tutors in teachers' training colleges in

India, the current study focus was on public primary school teachers' integration of ICT integration in the teaching learning process in Kakamega County in Kenya.

A study conducted by Papaioannou and Charalambors (2011) investigated the attitudes that primary school head teachers in Cyprus had towards ICT. After analysing data from 250 principals using a sequential mixed method approach, the study found that principals of Cyprus's primary schools tended to view ICT positively in overall. The principals agreed that learning how to use a computer was beneficial and not a waste of time and that computer were indispensable as teaching tools across all subject areas. Even though principals had a positive attitude toward ICT, the study found several statistically significant differences regarding gender, years of service, academic qualifications, in-service training on ICT for teaching and learning, experience with computers, access to computers at home and the presence of computers in the principal's office. Majority of head teachers, however, were pessimistic about the effects of computers on society because they thought that these devices could dehumanize society, isolate individuals, and possibly even control people's lives. Nonetheless, it is important to take into account the demographic data of the Cyprus principals, as approximately 80% of them had access to computers and the internet at home. Additionally, 63.4% of principals received training on ICT integration for learning and teaching purposes, compared to 78.6% who received training on using ICT for personal errands. These demographic data may differ significantly from those of Kakamega County teachers, suggesting that their perspectives on ICT use may change. This study was conducted in primary schools in Cyprus and therefore its findings may not be generalized to the Kenyan situation. The present study was conducted in public primary schools in Kakamega County in Kenya.

Singh and Chan (2014) presented a number of findings from a study intended to gauge secondary school teachers' knowledge and attitudes regarding the use of ICT in the classroom in Malaysia. The study used questionnaire and questionnaire to collect data from 630 participants. The study found that the majority of teachers (92%) felt at ease using computer programs like spreadsheets, email, the internet, and presentation software. It was also found that more than 80% of teachers were proficient in graphics

software and computer maintenance, in contrast to the majority of the other reviewed studies. Only 20% of teachers, however, were proficient in conducting quick and easy information searches online. Most notably, educators displayed a positive attitude toward ICT use. The majority of them described how ICT was used to teach and learn and how students benefited from it by creating a digital foundation for their future academic endeavours, careers and personal lives. Despite not evaluating the accessibility of ICT resources, Singh and Chan's (2014) study suggested that respondents with high ICT proficiency had sufficient exposure to ICT resources. As a result, it was necessary to determine how much ICT was being used for teaching and learning in Kakamega County.

Tziafetas (2013) surveyed the perceptions of teachers towards the adoption of ICT in Greek primary schools. The study gathered data from 87 respondents using a simple random sampling technique and an online questionnaire. It was found that, although having favorable perceptions toward interdisciplinary approaches to ICT, ICT teachers hardly collaborate with teachers of other academic areas. Additionally, the study found that, more than 76% of the teachers believed that, the Ministry of Education's focus on the requirement of pedagogical training for ICT teachers seemed to be heading in the right direction because it can strengthen their sense of competence and help to increase the efficacy of the educational system. The study recommended that; the government should provide funds for more training of teachers in ICT. The study was however, limited to a questionnaire to collect data and this might have affected the validity and reliability of the study. The present study used questionnaire and interviewed schedules to collect data from 546 respondents from public primary schools in Kakamega County in Kenya.

Jane (2018) investigated how successfully teachers of Mathematics and Science in the Bula District, Division of Camerines Sur, in the Philippines, integrated ICT into the classroom. The study received responses from 42 Mathematics and Science teachers in total. Most of the teachers who responded to the questionnaire were in their 20s and 30s, as per the results of the survey. The majority of them had a history of service ranging from 0 to 10 years. They had been in ICT training for the past five years, but they just

covered the fundamentals of using a computer. A chi-square test showed that neither ICT competency nor the four categories of ICT competency were significantly related to teachers' perceptions of ICT contributions to Mathematics and Science teaching. The study also revealed that Filipino teachers in the Bula District were open to using ICT in the classroom, as demonstrated by their proficiency with the technology, operations and concepts, as well as with social/ethical, pedagogical and professional aspects. The study recommended a follow-up study focusing on the teacher respondent's degree of competency in order to further define the knowledge gained from the ICT training attended. To improve teachers' ICT knowledge and skills, school ICT coordinators were urged to offer professional development activities, particularly in the areas of hardware, software, computer troubleshooting and repair, and maintenance. The study also recommended another similar study focused on how ICT resources provided by the Department of Education were used in various subject areas and dimensions to be conducted. ICT coordinators should organize training sessions that concentrate on pedagogical and professional aspects. This study was however done in Filipino on teachers of Mathematics and Science and therefore its findings cannot be generalized to a Kenyan situation. The present study was conducted in public primary schools in Kakamega County in Kenya.

Daniel et-al. (2019) conducted a study on ICT integration in teaching and learning business management in the Senior High Schools in Ghana's Sekondi-Tarokoradi Metropolis. The study employed a descriptive survey design. The Sekondi Takoradi Metropolis' Senior High School students and business management teachers were its target population. The study's sample consisted of 165 business management students and 10 business management teachers. Questionnaire were used to collect the data. The study found that, teachers favored using ICT technology to teach, despite their complexity. ICT was preferred over conventional methods since it requires less time for teaching and learning. The study recommended that the government should establish a setting that makes it simple to use computer software to enhance teaching and learning through the Ministry of Education. The study also recommended that the government should likewise

provide teachers and students with ICT supplies including computers, projectors, Wi-Fi, and other ICT accessories.

Paola and David (2012) evaluated the usage of ICT in primary schools in Malawi. They gathered information from 238 respondents using interview schedules. Questionnaire was used to collect data from the respondents. The study found that, teachers were excited about the implementation of the ICT program because they could see how it would benefit both the students and themselves. They also believed that the development of learning machines (technology) had assisted them in changing their methods of instruction and introducing fresh ideas. However, the study found that experienced teachers were less eager to incorporate ICT in teaching and learning because they were reluctant to use the technology themselves and were afraid to let pupils use it independently. The study recommended that, the government should provide more funds for ICT infrastructure to motivate and change teacher perception towards the use of ICT in classroom practices. However, because this was conducted in Malawi, its findings cannot be generalized to Kenyan situation. The present study was conducted in public primary schools in Kakamega County in Kenya.

Ndidde et al. (2016) did a presentation on technology and education: ICT in Ugandan teacher training colleges. The study used qualitative case study methods on ICT infrastructure assessment in 11 teacher training colleges in Uganda. Stratified random sampling and was used to identify 7 teacher training colleges initially; 4 additional colleges were purposefully sampled based on their high levels of ICT Data for the study was collected using observation and interview schedules. The study found that, teacher trainers in Uganda had negative opinions of the incorporation of ICT. Additionally, they lacked the mentality and willingness to adequately incorporate ICT into the teacher training process. Ndidde et al. (2016) further observed that the issue is related to a shortage of ICT equipment, inadequate pedagogical ICT integration capacity and a lack of incentives from institutions and the government to use ICT or create teacher-training curricula. However, this study was carried out in teacher training colleges in Uganda. The

present investigation was carried out in public primary schools in Kakamega County in Kenya.

Njathi et al. (2018) carried out a study to determine the relationship between principals' attitudes about computer use and how often computers are used in public secondary schools in Kiambu County for various tasks. Data from 205 sampled principals were gathered using a semi-structured questionnaire. According to the study, a mere 23.5% of principals stated they used computers daily. Taking into account the work that the government and other organizations had done to guarantee computer use in school administration, this was a very small percentage. Similarly, 94% of the respondents said that they only used computers very infrequently for administrative purposes, primarily for storing and retrieving information and creating student reports. The majority of principals also expressed low confidence in their use of ICT, and the Pearson coefficient correlation analysis revealed a moderately significant relationship between the principals' perception of computer application and computer use ($r(204) = 0.423$, $p < 0.001$). As a result, the majority of principals were technophobic and rarely used ICT in their administrative tasks. This raises some important questions, such as how these principals, as role models, would encourage and persuade teachers to integrate ICT into their work, and whether they have the moral authority to supervise ICT. However, the fact that this study was carried out in secondary schools in Kiambu County, its findings cannot be generalized to Kakamega County in Kenya. The present study was conducted in public primary schools in Kakamega County in Kenya.

Nzwili (2017) conducted a study to find out how teachers and principals in Kitui County, Kenya, felt about ICT integration into the public primary school curriculum. 776 teachers and 388 principals participated in the study. Among other things, principals and teachers shared the perception of ICT as a vital tool for enhancing performance, collaboration, learning outcomes, and learning experiences. In general, teachers and principals had positive opinions about the inclusion of ICT in the primary school curriculum. This was credited to the government's awareness-raising efforts around the "one laptop, one child" initiative. Nzwili (2017), however, did not look into how much technology was used in

the teaching and learning process by principals and teachers. Thus, though the study established that teachers in Kitui County appreciated the importance of use of technology, it failed to explain the low uptake of technology in Kitui County despite the adequacy of ICT facilities in some schools. The present study investigated on the influence ICT in teaching and learning in public primary schools in Kakamega County in Kenya.

2.6 Summary of Literature Review

In accordance with the study objectives, the researcher has reviewed literature from local, regional and global perspectives. According to the literature review, there are quite a few factors that influence teachers' integration of ICT in teaching and learning. These include teachers' training in ICT, availability of digital devices in schools, internet connectivity in schools and teachers' perceptions toward ICT integration in teaching and learning. However, it should be highlighted that the present study differs significantly from other ICT related reviewed studies in a number of important ways.

A few of the research that were reviewed concurred with the current study, whereas others did not. The use of ICT in teaching and learning was found to be influenced by teachers' ICT training, according to a review of the literature (Jasmasyah, 2022; Sulemana et al., 2018; Kamaruddin et al, 2017). According to the literature review, there was little ICT training for teachers (Mwunda & Agutu, 2018; Mbithe, 2016). This made it more difficult for teachers to integrate ICT into classroom teaching and learning. Primary school teachers struggled to effectively integrate ICT into teaching and learning due to a lack of or inadequate ICT digital devices and internet connectivity. (Ndidde et al., 2016; Obota, 2015; Murithi, 2021; Nokiri et al., 2021; Sanja et al., 2014 & Sekiguchi 2011). Further, it became clear from the literature review that, despite teachers' positive perceptions toward using ICT in teaching and learning in schools, they were not doing so because of other limitations (Beri & Sharma, 2019; Tziafetas 2013; Paola & David 2012). In contrast to this study, the majority of the reviewed studies (Beri & Sharma, 2019; Njathi et al., 2018; Nurhabibah et al, 2018; Mehari, 2020) and others focused on the use of ICT in the post-primary education process. In comparison to public primary schools,

majority of post-primary institutions have better ICT infrastructure, as reported by Obota et al. (2015). The contextual differences between the proposed study and the few studies that concentrated on primary schools (Papaioannou & Charalambors, 2011; Sutter & Kihara, 2019) are significant. The Papaioannou and Charalambors (2011) study focused on head teachers of primary schools in Cyprus who had high levels of ICT training and had access to computers and the internet at home. This study was necessary because it is not possible to assume that the results of similar studies will apply to public primary schools in Kakamega County. Therefore, the purpose of the current study was to bridge these knowledge gaps.

2.7 Theoretical Framework

Mishra and Koehler's (2008) Technological Pedagogical Content Knowledge (TPACK) theory provided the basis for this study for Technology Integration in Teaching and Learning. Technological Pedagogical Content Knowledge (TPACK), as defined by Mishra and Koehler (2008) is a means of conceptualizing the knowledge that teachers need to have in order to successfully integrate technology into their classes, including computer literacy and subject matter. The three components of Technology, Pedagogy and Content, as well as how they interact make up TPACK, according to Mishra and Koehler (2008). The interaction of the three core elements leads to the production of technology pedagogical knowledge (TPK), pedagogical content knowledge (PCK) and technical pedagogical content knowledge (TPACK). Figure 2.1 of the TPACK framework shows the connections between the three domains: technological knowledge, pedagogical knowledge, content knowledge and knowledge that teachers are operating in this complex space.

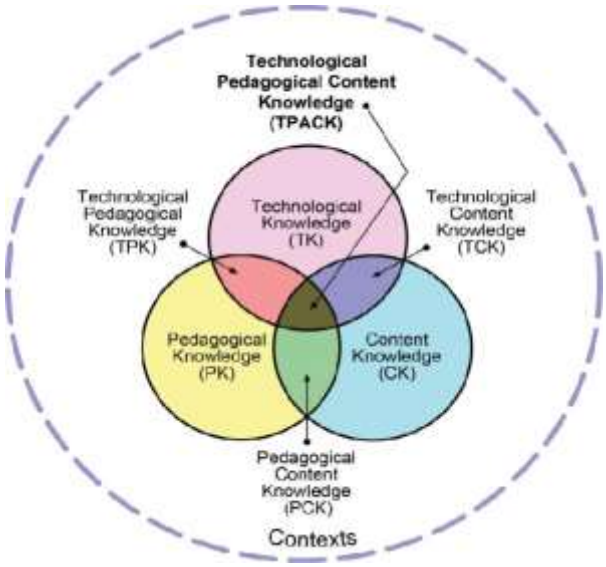


Figure 2.1: Technological Pedagogical Content Knowledge Model (TPACK) by Mishra and Koehler (2008)

According to the TPACK framework, to guide and instruct students towards a better and more robust understanding of subject content, technological tools such as software, hardware and applications should be used. To achieve this, the three types of knowledge CK, PK and TK are combined and recombined in various ways within the TPACK framework. Technological content knowledge (TCK) describes relationships and interactions among technologies and learning objectives, pedagogical content knowledge (PCK) describes the same between pedagogical practices and specific learning objectives while Technological pedagogical knowledge (TPK) describes relationships and interactions between technological tools and specific pedagogical practices.

Mishra and Koehler (2008) theory explicate that the lack of awareness of TPACK keeps technology separated from content and pedagogy. This leads to some problems with using technology in the classroom. First, there occurs rapid changes in technology that the teacher and learners find it extremely difficult to keep pace and end developing unfounded technophobia. The second problem arises from the fact that most software is designed for business, not for education. It therefore, means that students end up learning how to use the program and not learning the content of the class. The third problem that arises when technology is separated from content and pedagogy is the situational nature

of the classroom. For instance, though an instructor may adjust a lesson to suit specific learners' needs, the available instructional video remains the same every time it is played.

Despite the critiques, the TPACK framework was relevant for this study relevant in this study since it is a productive way of considering how teachers could integrate ICT into the classroom. Additionally, TPACK can also serve as a measurement of instructor knowledge in ICT, subject matter content and pedagogy, potentially influencing both training and professional development offerings for teachers at all levels of experience. Further, TPACK assists in minimizing the teachers' tendency of treating technology as if it is separate from teaching and learning. It follows that professional development for teachers should desist from training teachers on how to use some particular software or app only, but also on how to fit it into classroom. By so doing, teachers will have self-efficacy in application of ICT and thus shape their attitude towards use of technology in classrooms.

2.8 Conceptual Framework

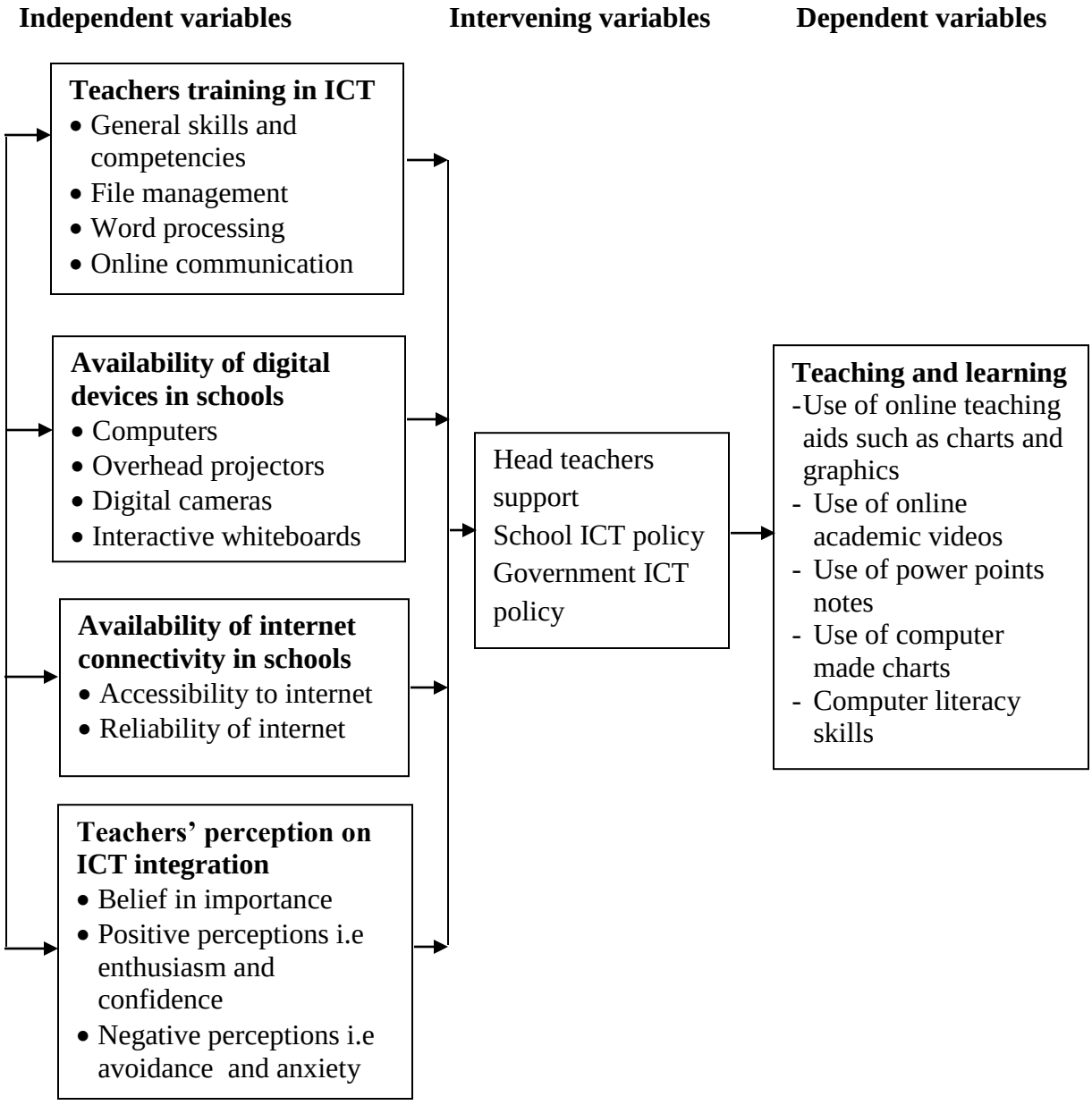


Fig 2.2: Conceptual framework showing the relationship between ICT integration and teaching and learning in primary schools

According to Figure 2.2, the four independent variables were conceptualized to have a relevant and relative influence on integration of ICT in teaching and learning in public primary schools in Kakamega County. In other words, teachers' training in ICT, Availability of digital devices in schools, availability of internet connectivity in schools

and teachers' perceptions toward ICT integration were assumed to influence the integration of ICT in teaching and learning. The study TPACK theoretical framework has influenced the conceptual framework. When technological knowledge is appropriately combined with content and pedagogy knowledge and taking into account the prevailing contexts, complete ICT integration in teaching and learning can be achieved.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Introduction

The research design, target population, sampling methods, sample size, research instruments and the validity and reliability of the instruments are all covered in this chapter. This chapter also discusses methods for gathering data, ways for analyzing data and ethical issues.

3.2 Research Design

This study used descriptive survey design. Orodho (2005) asserted that the research design used for a study depends on the question the researcher is attempting to answer. Based on this argument, this study sought to investigate the influence of integration ICT in teaching and learning in public primary schools in Kakamega County in Kenya. Orodho (2005) also observed that, a sample of respondents are interviewed or given questionnaires as part of the descriptive survey design of data collecting. This study therefore collected data by interviewing respondents and administering questionnaires to the respondents. In this study, data were also gathered using a descriptive survey design with the objectives of describing the nature of the current conditions, identifying the benchmarks against which the current conditions can be compared and determining the relationships between specific events (Orodho, 2005). This study looked into the factors that were already having an influence on teachers' integration of ICT in teaching and learning. Teachers' training in ICT, the availability of adequate and appropriate computer facilities in schools, adequate and dependable internet connectivity in schools and teachers' perceptions regarding ICT integration in the classroom were among these criteria.

Marshall and Rossman (1989) observed that descriptive survey design is accurate in measurement and the results can be generalized to a larger population within known limits of error. Further, the design is amenable to rapid statistical analysis and it is comparatively appropriate to administer and manage. This study opted for this design as a

way of collecting first-hand data from respondents to formulate rational and sound recommendations for the study. Moreover, according to Gay (1987) the descriptive survey method is a technique for obtaining data in order to respond to inquiries regarding the status of a research issue. Data collection was necessary for the study in order to address concerns regarding influence of teachers' integration of information communication technology in teaching and learning in public primary schools in Kenya. Two phases of the investigation were conducted: the research phase and the preliminary phase. The preliminary phase acted as a pilot project to determine the viability of the study, while the research phase served as the primary study.

3.3 Target Population

Population refers to all elements, individuals or objects having similar observable characteristics (Creswell, 2014). The study targeted 3204 public primary school teachers, 356 public primary school head teachers, 1 County Director of Education and 356 public primary schools in Kakamega County (County Director of Education, 2022). The head teachers were targeted since they were expected to spearhead the ICT uptake in their schools as well as soliciting ICT resources from various sources. Teachers were targeted since they are the main implementers of the ICT integration programme in the classroom.

3.4 Sampling Techniques and Sample Size

Sampling is the process of selecting a subset of the population in order to draw conclusions about the entire universe (Cohen, 2018). This study used stratified, proportionate, simple random, purposive and census sampling techniques. Stratified sampling technique was used to select schools to ensure that all the subsets were adequately represented in the sample. In order to achieve this, schools in Kakamega County were divided into strata based on 12 administrative divisions. Proportionate sampling technique was used to sample 356 schools from 12 administrative divisions in Kakamega County. It was also used select 3204 public primary school teachers. Intensity sampling was used to sample the study population using purposive sampling technique. According to Mugenda and Mugenda (1999) intensity sampling entails choosing cases that strongly display the phenomenon of interest. In this regard, purposive sampling

techniques was used to select 356 public primary school head teachers in Kakamega County. According to the simple random sampling techniques presumption, every element in the universe has an equal chance of being included in the sample (Kothari, 1990). The researcher used this sampling technique to sample 356 public primary schools and 3,204 public primary school teachers in Kakamega County. The County Director of Education, Kakamega County was sampled using census sampling techniques. According to Saunders et al (2016) it is important that sample size should be large enough to provide necessary confidence in the data collected. Thus, 546 respondents in all made up the sample frame. In order to arrive at the sample size of the study, the study determined the entire target population, decided on the level of confidence, which was 95 percent in this case and decided on the margin of error, which was 5 percent in this case. The study then computed the sample size of the study using Slovin's formulae. Table 3.1 shows the sample size distribution.

$$n = \frac{N}{1+Ne^2}$$

Where:

n is the required sample size

N is study population

e is the margin error

Table 3.1: Sample size distribution

Category of respondents	**population**	**sample size**
Head teachers	3,204	356
Teachers	356	189
County Director of Education	1	1
Totals	**3561**	**546**

3.5 Research Instruments

Data was collected for the study using a questionnaire and an interview schedule. Both public primary school head teachers and public primary school teachers filled out the questionnaire. Using the questionnaires, the researcher was able to gather information from a number of geographically distinct sources. The goal of the interview schedule was to get more information about study from the County Director of Education. The information from the quantitative data was confirmed using an interview schedule. Additionally, it was utilized to verify and support questionnaire results.

The questionnaires were administered to teachers and heads of public primary. A, B, C, D and E comprised the five sections of the questionnaires. Age, gender, educational level, and work experience were among the demographic details section "A" respondents were asked to provide. Section "B" gathered data on how ICT training for teachers influenced teaching and learning in public primary schools. Data collection for section C focused on how the availability of computer facilities in public primary schools influenced both teaching and learning. The aim of section "D" was to collect data on internet connectivity and how it influenced teaching and learning in public primary schools. Section 'E' contained a 5-point Likert scale that was used to assess how much ICT integration in public primary schools was associated with teaching and learning. Both closed-ended and open-ended questions, as well as Yes/No questions were included in the questionnaires. The open-ended questions gave the researcher the opportunity to get information from a large number of respondents at once and to obtain specific details (Ngumbo, 2006). The interview schedule was used to obtain data regarding the County Director of Education. The interview schedule collected qualitative data on the four objectives of the study.

3.6 Validity of the Instruments

Validity is the degree to which an indicator or set of indicators designed to measure a notion, accurately captures that concept (Allan & Teevam, 2005). The study used content validity. According to Orodho (2008) a non-statistical method called content validity is used to validate the contents of the questionnaires. Content validity was enhanced by use of expert opinion from university supervisors. Gay (1987) stated that expert judgment is

how validity is established. The comments from university supervisors were used to enhance the validity of the tools. In order to test the validity of the instruments, this study conducted a pilot study. Piloting was carried out to check whether the research tools matched the study objectives and research questions. Additionally, it was done to determine how long it would take to answer each question. Also, it made it possible for the researcher to spot discrepancies, ambiguities and misinterpretations of the research instruments. Mugenda and Mugenda (2003) stated that, 2% of the target population is enough for pilot study in descriptive survey studies. Using this criterion of 2%, 12 public primary schools, 12 public primary schools head teachers and 65 public primary school teachers were selected for a pilot study respectively. The twelve public primary schools, the twelve head teachers and the sixty-five public primary school teachers were purposively selected. The primary schools and participants who were selected for a pilot study were excluded from the final study. Participants were encouraged to comment and make suggestions geared to improve the various items.

3.7 Reliability of the Instruments

The consistency of data or results obtained from repeated trials is the measure of a research tool's reliability (Babbie, 2014). A research instrument is considered reliable when it satisfies the previously mentioned requirements, regardless of the environment, it can be used multiple times and produce comparable results. Instrument's reliability was established during a pilot study which was done in 12 public primary schools. During a pilot study, a test-retest method was used. Using this method, the same subjects were given the same instruments twice. The test-retest method was used to measure the reliability of the head teachers and teachers' questionnaire. The questionnaire was administered to the respondents during pilot testing and administered again after a duration of two weeks. The scores from both testing periods were correlated to determine their reliability using Pearson Product Moment Correlations Coefficient as indicated.

$$r = \frac{N\sum XY - (\sum X)(\sum Y)}{\sqrt{(N\sum X^2 - (\sum X)^2)(N\sum Y^2 - (\sum Y)^2)}}$$

Key:

r = correlation

N= number of pairs of scores

$\sum XY$ = Sum of the products of the paired scores

$\sum X$ = sum of X scores

$\sum Y$ = sum of Y scores

$\sum X^2$ = sum of squared X scores

$\sum Y^2$ = sum of squared Y scores

A correlation coefficient of 0.76 for teachers and 0.75 for head teachers were obtained. According to Cohen et al (2012) reliability coefficient of 0.7 or higher is deemed adequate for a social science research instrument.

3.8 Data Collecting Procedures

The researcher applied for authorization from South Eastern Kenya University and a research permit from the National Commission for Science, Technology and Innovation (NACOSTI). Following acquisition of these, researcher provided required documentation to the County Commissioner and County Director of Education in Kakamega County, who in turn approved the study to be conducted there. The researcher then gave the County Commissioner's letter of authorization to the Deputy Sub-County Commissioners and the Sub-County Director of Education of the pertinent Sub-Counties in Kakamega County. The researcher next scheduled a meeting with the head teachers of the sampled public primary schools in order to visit and distribute the questionnaires. After receiving instructions and a confidentiality guarantee, the respondents were given enough time to complete the questionnaires. The researcher then collected the completed questionnaires. The researcher also planned a meeting with the County Director of Education for Kakamega County, after which an interview was held.

3.9 Data Analysis Techniques

To make sure the information gathered on the ground was accurate, compliant with other study criteria and keyed, it was carefully scrutinized. This was done to make coding and

tabulation easier. According to Bryman's (2012) suggestion, the researcher used a well-designed chart or matrix to code and categorize the field data. The researcher created four themes in this area based on the research objectives. These were teacher training in ICT, availability of computer facilities in schools, availability of internet connectivity in schools and teachers' perspectives on ICT integration in classrooms. According to Creswell (2012) it is easier to create a qualitative report with a lot of content when there are a limited number of subjects. Coding was done by giving the questions labels. For example, closed inquiries were denoted by the letters CQ (Creswell, 2009). It was also done to enable the researcher to study a huge amount of data. Coding and analysis were carried out to decode the raw data and derive meaning (Orodho, 2008). Following that, coded data was revised and carefully examined to look for any errors or omissions.

With the aid of descriptive and inferential statistics, the data was examined on both a qualitative and quantitative level. The data was then summarized in tables, charts, and bar graphs to make it easier to grasp the findings and to make it more compact for future research. Statistical Package for Social Sciences (SPSS) was used to code data and conduct both qualitative and quantitative analyses, which made it easier to sort the data and calculate frequencies and percentages. Interviews' open-ended questions and data were recorded, transcribed and organized. The degree of correlation between ICT integration and teaching and learning in public primary schools was evaluated using the Chi-square (x^2) test. This approach was also used to gauge how strongly the independent and dependent variables were related. Cronbach alpha (α) (0.05) served as the significance criterion.

3.10 Ethical Considerations

To ensure ethical considerations, the respondents were assured of anonymity and utmost confidentiality. This was achieved by keeping the respondents' identity confidentially by not allowing them to write their identity on the questionnaire. This assisted the study in getting responses that are more honest. To observe copy rights and avoid plagiarism, the researcher acknowledges all the sources of information collected from reviewed journals articles, textbooks, unpublished and published theses as well as other research materials.

The respondents were also allowed to scrutinize the transcribed information and expunge any sections that might not reflect what they meant.

CHAPTER FOUR

4.0 RESEARCH RESULTS

4.1 Introduction

Data collected from 356 public primary school teachers, 189 public primary school head teachers and 1 County Director of Education in Kakamega County were used to present and analyze the research findings in this chapter. The study sought to investigate the influence of integration of information communication technology in teaching and learning in public primary schools in Kakamega County in Kenya. The specific objectives of the study were to: assess the influence of teacher training, determine the influence of availability of digital devices, establish the influence of internet connectivity and to determine the influence of teacher perceptions toward ICT and integration of ICT in teaching and learning in public primary schools in Kakamega County, Kenya. The results of this study were based on the responses of the public primary school teachers, head teachers and County Director of Education who were all purposively selected in Kakamega County. The contents of this chapter are as follows: the percentage of respondents who returned the questionnaires, demographic data about the respondents and the findings drawn from the research questions in light of the study's objectives.

4.2 Response Rate

Data were gathered from 356 sampled public primary schools in Kakamega County using two sets of questionnaires. One set of questionnaires was for public primary school head teachers and another set of questionnaires was for the public primary school teachers. The results of the study are displayed in Table 4.2.

Table 4.1: Questionnaire return rate

Category of school	Number of Questionnaires Administered	Number of Questionnaires filled and returned	Percentage
Public primary School Teachers	356	285	80.06
Public primary school Head teachers	189	143	75.67
Total	**545**	**428**	**78.53**

Table 4.2 indicates that, 285 (80.06%) of the public primary school teachers and 143 (75.67%) of the public primary school head teachers returned the questionnaires. This accounted for 78.53% of the respondents who returned the questionnaires. Only one County Director of Education was interviewed hence the response rate for the interview with him was 100%. Mugenda and Mugenda (2003) observed that, a response rate of 50% is sufficient for analysis; a rate of 60% is good and a rate of 70% or higher is excellent for reporting. Based on this argument, the response rate was excellent for statistical inference.

4.3 Demographic Information on the Respondents

Teachers and head teachers were asked to provide demographic data on a number of different variables for the study. Descriptive statistics from the information gathered from public primary school teachers and head teachers were presented and analyzed. The purpose of this data was to aid the researcher in comprehending the backgrounds of the survey respondents. This was done by asking respondents to fill out questionnaires with information about their gender, age, educational background and teaching experience.

Additionally, they had to specify whether the institution they were working for was a public primary boarding school or public primary day school. The demographic information helped the researcher to understand participants he was dealing with in the study.

4.3.1 Teachers' distribution by gender

The distribution of the sampled public primary school teachers was sought by gender. The results are displayed in figure 4.3.

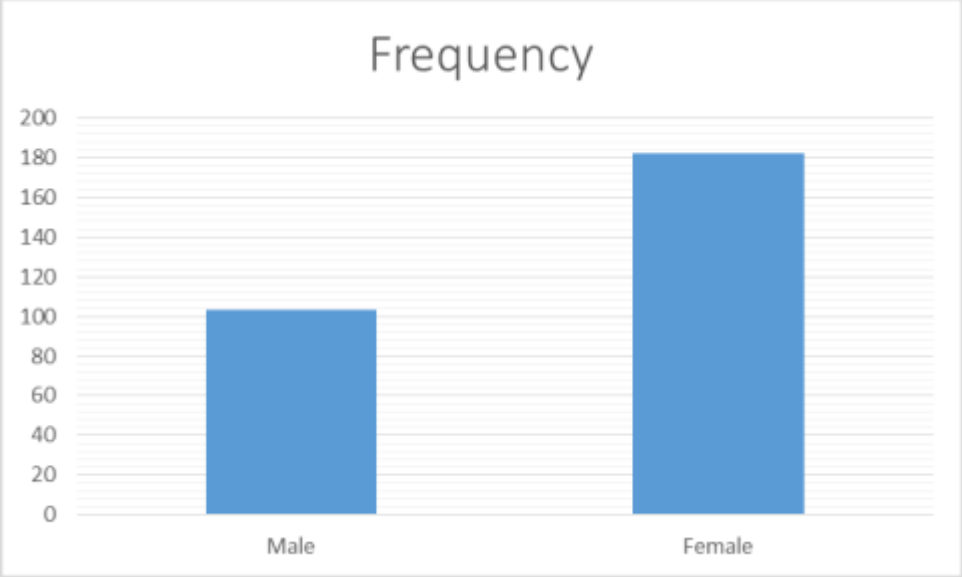


Figure 4.1: Public primary school teachers' distribution by gender

According to data in figure 4.3, 103 (36.14%) respondents were male teachers whereas 182 (63.86%) respondents were female teachers. This implies that, more female gender teachers join the teaching fraternity than the male teachers. The findings of this agree with a study conducted by Nurhabibah et al (2018) who found that, majority of public primary school teachers are female.

4.3.2 Teachers Age Distribution in Public Primary Schools

The study intended to determine the average age of sampled teachers in public primary schools. The findings are shown in Table 4.3.

Table 4.2: Teachers age distribution in public primary schools

Age (Years)	Frequency (f)	Percentage (100%)
20 < less	00	00
21 – 30	53	18.60
31 - 40	97	34.04
41 - 50	114	40.00
51 >	21	7.36
Total	**285**	**100**

Results in table 4.3 shows that, teachers' age ranging between 41 and 50 years accounted for 40% and those of ages less than 20 years accounted for 0.00 %. This was followed by teachers who were above 51 years and they constituted 4.20%, 53 (18.60%) of the sampled teachers were between 21 and 30 years and the teachers between 31 and 40 years constituted 97 (34.04%). According to the study's findings, teacher ages and their usage of ICT for teaching and learning are related. Majority of respondents in public primary schools were in their forties, according to results. This makes them more qualified to integrate ICT into teaching and learning. These study findings concur with that of Nurhabibah et al. (2018) who teachers in the age group of 21 to 40, who were relatively younger, had higher ICT literacy than teachers in the older group.

4.3.3 Teachers academic qualification in public primary schools

The investigation also looked into academic backgrounds of the sampled teachers. The results are presented in table 4.4.

Table 4.3: Teachers' academic qualification

Qualification	Frequency (f)	Percentage (100%)
M. Ed.	6	2.11
B. Ed.	70	24.56
Dip/ Ed.	79	27.72
Cert (P1)	125	43.86
Others	5	1.75
Totals	**285**	**100**

The data in table 4.4 indicates that, 125 public primary school teachers in Kakamega County accounting for 43.86% had P1 certificates, 79 (27.72%) had Diploma in education certificates and 70 (24.56%) had Bachelor of education degrees. 6 (2.11%) had Master of education degrees. 5 (1.75%) of the respondents had other certificates. According to the study's findings, while the majority of teachers in public primary schools possessed P1 certificates, few teachers held Masters' degrees. Since there is strong correlation between teachers' academic backgrounds and how much ICT is used in their lessons. It can be inferred that, teachers with higher academic credentials are more inclined than those with lower credentials to integrate ICT into their teaching and learning. These study findings support that of Nurhabibah et al. (2018) who found that teachers in the lower education group had lower ICT literacy levels.

4.3.4 Teachers' work experience in public primary schools

The study also sought to find out the teaching experience of sampled teachers. The findings of study are as shown in figure 4.4.

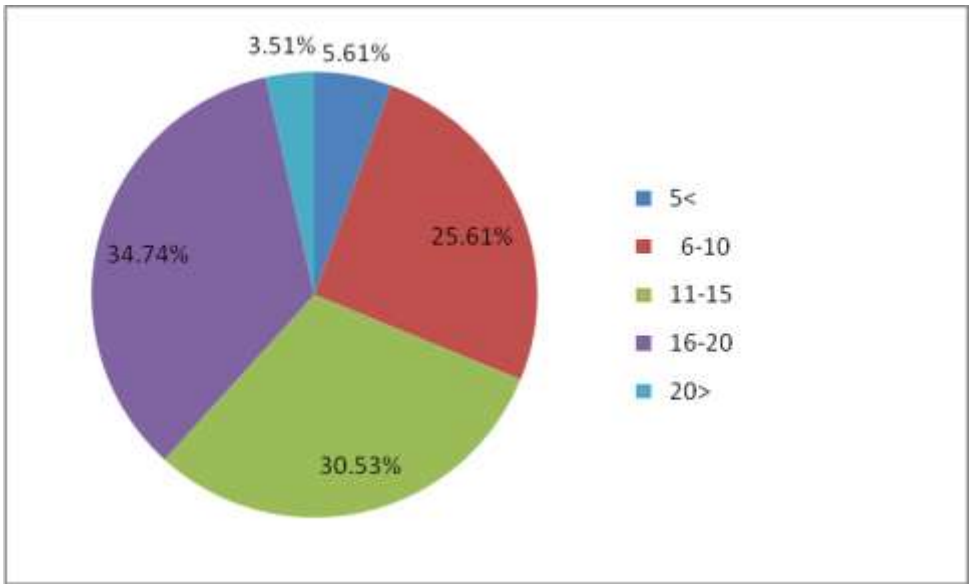


Figure 4.2: Teachers' work experience in public primary schools

Figure 4.4 demonstrates that 34.74 percent of the teachers had between 16 and 20 years of experience in the classroom. Less than 5 years had 5.61%, 6 to 10 years (25.61%), 11 to 15 years (30.53%) and more than 20 years (3.51%) of teaching experience were next. These findings revealed that, majority of teachers in public primary schools in Kakamega County had a fair amount of experience in the classroom, making them more competent to understand the influence of teachers' integration of ICT in teaching and learning. Since the usage of ICT in teaching and learning is correlated with a teacher's level of experience, it was expected that teachers with a lot of experience working in public primary schools would incorporate ICT into their lessons. However, it should be noted that this was not the case. According to the study's findings, teachers in public primary schools with less experience integrate ICT for teaching and learning more frequently than teachers in schools with more experience.

4.3.5 Categories of public primary school

The participants in this study came from two different categories of public primary schools, that is, boarding and day public primary schools. In respect to this, public primary school teachers were asked to indicate whether the public primary school they

were teaching in was either boarding or day public primary school. Table 4.5 shows their responses.

Table 4.4: Categories of public primary schools

Category of public primary school	frequency	percentage
Boarding	67	23.51
Day	218	76.49
Totals	**285**	**100**

Table 4.5 shows that, 218 (76.49%) of the teachers were working in public primary day schools, whereas 67 (23.51%) of the teachers said they were working in public primary boarding schools. The type of public primary school can influence integration of information communication technology in teaching and learning. More public primary boarding schools than public primary day schools had adequate ICT facilities. As a result, teachers in public primary boarding schools had an advantage over their counterparts in public primary day schools. The results of this study in table 4.5 showed that, there were more public primary day schools than public primary boarding schools in Kakamega County. Further examination of the statistics revealed that, the number of public primary boarding schools that had integrated ICT in teaching and learning outweighed the number of public primary day schools in Kakamega County. From these findings, we deduced that, public primary boarding schools were well established in terms of facilities including computer facilities than public primary day schools. As a result of their exposure to these ICT resources in their schools, teachers at public primary boarding schools were more prepared to accept and integrate ICT in teaching and learning than those in public primary day schools. In support of these findings, Manduku (2012) asserted that boarding schools appeared to adapt and utilize ICT in teaching and learning process as compared to day schools. The study also collected information on the demographics of the head teachers of public primary schools. The results are presented in table 4.6.

Table 4.5: Head teachers' demographic data in public primary schools

Demographic data		Frequency (f)	Percentage (100%)
Gender	Male	82	57.34
	Female	61	42.66
Ages (years)	20-30	22	15.38
	31-40	36	25.25
	41-50	60	41.96
	51-60	24	16.78
	60 and above	01	00.70
Work experience as a	1-5	16	11.19
head teacher (years)	6-10	41	28.67
	11-15	56	39.16
	16-20	27	18.88
	Over 20	03	02.10
Highest academic qualifications	M.Ed.	03	02.10
	B. Ed.	31	21.68
	Dip/Ed.	37	25.87
	P1 Certificate	72	50.35
	Others	00	00.00
	Over 20 years	00	00.00
Type of public primary	Boarding	43	30.07
School	Day	100	69.93

Table 4.6 reveals that, 82 (57.34%) of the public primary school head teachers were males. The female gender represented 61 (42.66%). 60 representing 41.96% were of the age bracket 41-50 years. This was followed by those teachers between 31-40 years, 36 (25.25 %) while 22 of those between ages 20-30 years accounted for 15.38%. 24

(16.78%) had their ages between 51-60 years. Only one head teacher (0.70%) was in the category age of 60 years and above.

In regard to their experience, the head teachers who had headship experience of between 11 and 16 years accounted for 39.16%. This was followed by 41 (28.67%) of the head teachers who reported that, they had an experience of between 6 to 10 years as head of institutions. The head teachers whose headship experience fell between 16 to 20 years were 27 representing 18.88%. This was followed by those whose headship experience fell between 1 to 5 years representing 11.19% and those whom headship experience was above 20 years were 3 and they were represented by 2.10%. In relation to academic qualification, 72 of the head teachers representing 50.35% had p1 certificates, 37 (25.87%) had Diploma in education, 31 accounting for 21.68% had Bachelor of education degree and 3 representing 2.10% had Master of education degrees. None of the sampled head teachers had other certificates. Regarding the category of public primary schools, the study found that, 100 (69.93%) of the public primary schools were day public primary schools while 43 (30.07%) were public primary boarding schools.

4.4 Teacher Training in ICT and Integration of ICT in Teaching and Learning in Public Primary Schools

The first objective of this study was to assess the influence of ICT integration teacher training on the integration of ICT in teaching and learning in public primary schools in Kakamega County in Kenya. The information in this part was collected to find out whether the respondents had any ICT training in order to integrate it in teaching and learning in public primary schools. The question that was posed was: What influence does teacher training in information communication technology have on how ICT is integrated in teaching and learning in public primary schools in Kakamega County?

4.4.1 Teachers' response on whether or not they were trained for ICT integration in teaching and learning

Sampled public primary school teachers were asked to indicate whether or not they were trained in ICT to integrate it in teaching and learning. Their responses were as given in the Table 4.7

Table 4.6: Public primary school teachers' response on whether they were trained in ICT for integration in teaching and learning

Category of public primary school	Trained	Untrained	Total *(%)*
Boarding	57 (85.07%)	10 (14.93%)	67 (100%)
Day	78 (35.78%)	140 (64.22%)	218 (100%)
X^2 =3.121			
p=0.003			

Table 4.7 shows that, fifty-seven (85.07%) of the public primary boarding school teachers were trained in ICT to integrate it in teaching and learning while ten (14.93%) in these categories of schools were not. Only seventy-eight (35.78%) of teachers in public primary day schools in Kakamega County were trained in ICT to integrate it in teaching and learning. One hundred and forty (64.22%) out of 218 teachers in these categories of public primary schools were not trained in ICT. The chi-square test with a P-value (probability) at 95% confidence interval revealed that, there was a relationship between the category of public primary school and level of teachers training in ICT. The results indicated that, the number of teachers who had received ICT training in public primary schools was considerably high in boarding schools (X^2 = 3.121, df = 0.005, P = 0.003). Head teachers of the sampled public primary schools revealed similar findings. Their results are presented in table 4.8.

Table 4.7: Head teachers' responses on whether or not their respective public primary school teachers were trained in ICT for integration in teaching and learning

Category of public primary school	Trained	Untrained	Total (%)
Boarding	42 (62.69%)	25 (37.31%)	67 (100%)
Day	22 (28.95%)	54 (71.05%)	76 (100%)
Totals	**64 (44.76%)**	**79(55.24%)**	**143 (100%)**

Table 4.8 shows that, 42 of the head teachers representing 62.69%% of the public primary boarding schools reported that, their respective teachers were trained in ICT while 25 (37.31%) in this category of public primary schools said that, their teachers were not trained ICT to integrate it in teaching and learning. 22 of the head teachers in public primary day schools representing 28.95% reported that, their respective teachers were trained in ICT while 54 (71.05%) of the head teachers reported that, their respective teachers were not trained in ICT to integrate it in teaching and learning.

4.4.2 Public primary school teachers' academic qualification in ICT for integration in teaching and learning

Public primary school teachers of the sampled public primary schools in Kakamega County were asked to state their qualification in ICT. Their responses were as shown in figure 4.5.

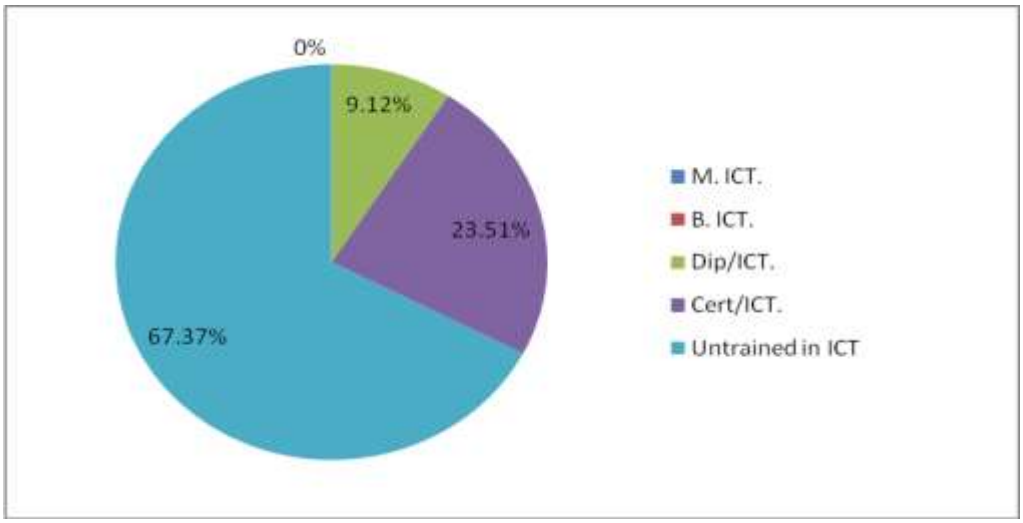


Figure 4.3: Public primary school teachers' academic qualifications in ICT for integration in teaching and learning

Figure 4.5 demonstrate that, there were twenty-six (9.12%) teachers who reported that they had Diploma in ICT, sixty-seven (23.51%) reported that, they had certificate in ICT while one hundred and ninety-two (67.37%) reported that they were not trained in ICT. In relation to this variable, head teachers were asked to indicate the qualifications in ICT of their respective teachers. Their responses were as shown in table 4.9.

Table 4.8: Public primary school head teachers' response on their respective teachers' academic qualification in ICT for integration in teaching and learning

Teachers' level of training in ICT	Frequency (f)	percentage (100%)
M. ICT.	00	00.00
B. ICT.	00	00.00
Dip/ ICT.	17	11.88
Cert/ ICT.	50	34.97
Untrained in ICT	76	53.15
Totals	**143**	**100**

Table 4.9 indicates that, 50 (34.97%) of the public primary school head teachers reported that their respective teachers were trained in ICT at certificate level while 76 (53.15%) were not trained in ICT. Seventeen (11.88%) were trained in ICT with diploma. None of the head teachers reported that their respective teachers had either Bachelor or Master's degrees in ICT.

4.4.3 Public primary school teachers' ICT integration in teaching and learning

The study sought information on teachers' integration of ICT in teaching and learning in their respective public primary schools. The findings are displayed in table 4.10.

Table 4.9: Public primary school teachers' responses on ICT integration in teaching and learning

Do you integrate ICT in teaching and learning?	Frequency (f)	Percentage
Yes.	69	24.21
No.	216	75.79
Totals	**285**	**100**

Table 4.10's data demonstrates that whereas 216 (75.79%) public primary school teachers did not integrate ICT in teaching and learning, 69 (24.21%) of them did. The study also asked the head teachers for more details about how the teachers integrated ICT in teaching and learning in their various public primary schools. Their opinions are represented in table 4.11.

Table 4.10: Head teachers' responses on whether or not their respective teachers integrate ICT in teaching and learning

Do your teachers integrate ICT in teaching and learning?	Frequency (f)	Percentage (%)
Yes.	66	46.15
No.	77	53.85
Totals	**143**	**100**

According to table 4.11, 66 (46.15%) of the sampled public primary school head teachers believed that their teachers integrated ICT in the teaching and learning process, whereas 77 (53.85%) of the teachers in the same public primary schools did not.

4.4.4 Teacher responses on whether or not they had attended in service courses in ICT for integration in teaching and learning

Teachers in public primary schools were asked whether they had taken any ICT in-service courses in addition to their regular training. Table 4.12 displays their responses.

Table 4.11: Teachers' responses on whether or not they had attended in service courses in ICT for integration in teaching and learning

Have you taken any in-service course in ICT?	Attended	Not Attended	Total (%)
Boarding	38 (56.72%)	29 (43.28%)	67 (100%)
Day	47 (21.56%)	171 (78.44%)	218 (100%)
$X^2 = 7.156$			
P Value = 0.001			

Table 4.12 shows that, thirty-eight (56.72%) of the public primary boarding school teachers had attended in service courses in ICT while twenty-nine (43.28%) had not.

Forty-seven (21.56%) of the sampled teachers in public primary day schools in Kakamega County had attended in-service courses in ICT while one hundred and seventy-one (78.44%) of the sampled teachers in public primary day schools had not. Further computation indicated that, the number of teachers who had attended in-service courses in ICT were significantly low in all categories of schools ($X^2 = 7.156$, df = 0.05, P = 0.001). In relation to whether their respective public primary school teachers had attended in service courses in ICT for integration of ICT in teaching and learning, the sampled head teachers responded as shown in table 4.13.

Table 4.12: Head teachers' responses on whether or not their respective public primary school teachers had attended in service courses for ICT integration in teaching and learning

Have your teachers taken any in- service course in ICT?	Frequency (f)	percentage
Yes	47	32.87
No	96	67.13
Totals	**143**	**100**

Table 4.13 shows that, 47 (32.87%) of the public primary school head teachers reported that their respective teachers had taken ICT in-service training whereas 96 (67.13%) indicated they had not.

4.4.5 Public primary school teacher responses on relevance of in service courses in ICT for integration in teaching and learning

The public primary school teachers were also asked to comment on whether or not the in-service ICT courses they had taken were relevant for integrating ICT in teaching and learning. The responses they gave are shown in table 4.14.

Table 4.13: Teachers' opinions on whether or not the in-service ICT training courses were relevant for integrating ICT in teaching and learning

Was the in service course in ICT relevant?	Frequency (f)	percentage (%)
Yes	72	84.71
No	13	15.29
Totals	**85**	**100**

Seventy-two (84.71%) of the public primary school teachers reported that, the in-service ICT courses they had taken were relevant for integrating ICT in teaching and learning while thirteen (15.29%) of the teachers said the courses were not relevant for doing so. The sampled head teachers shared similar opinions about the relevance of the in-service ICT courses that their respective teachers from public primary schools had taken. The results are presented in table 4.15.

Table 4.14: Head teachers' responses on whether or not the in-service training courses attended by their respective public primary school teachers were relevant for integrating ICT in teaching and learning

Were the in service courses in ICT relevant to your teachers?	Frequency (f)	percentage
Yes	32	68.09
No	15	31.91
Totals	**47**	**100**

Table 4.15 shows that thirty-two (68.09%) of the head teachers reported that, the in-service courses attended by their respective public primary school teachers were relevant

while fifteen (31.91%) of them said that the in-service courses attended by their respective teachers were irrelevant for integrating ICT in teaching and learning.

4.4.6 Teacher responses on how in service courses attended by public primary school teachers were relevant for ICT integration in teaching and learning

Public primary school teachers were asked to explain the relevance of the in-service courses in ICT as far as integration of ICT in teaching and learning is concern. The findings are as shown in figure 4.6.

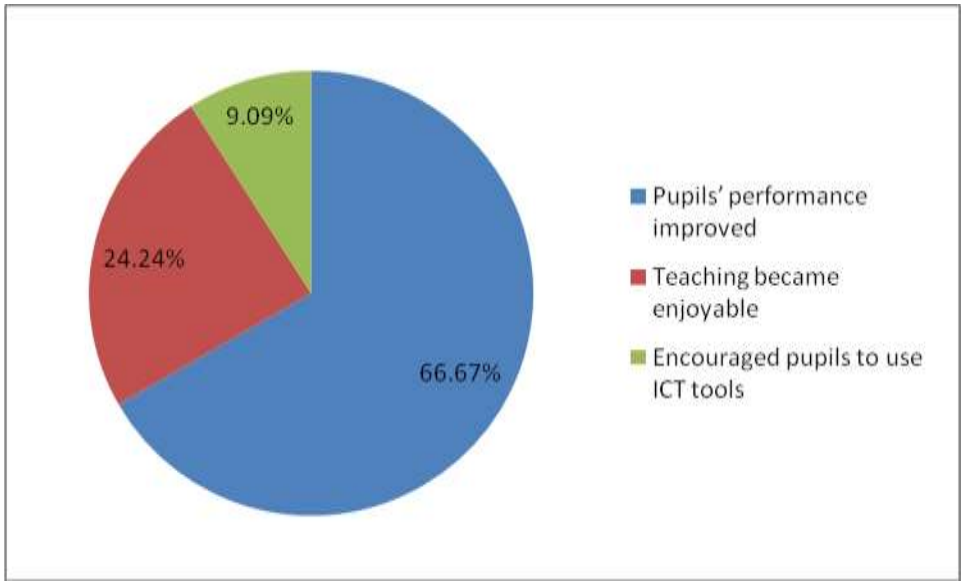


Figure 4.4: Teacher responses on how in service courses attended by public primary school teachers were relevant for ICT integration in teaching and learning

Figure 4.6 findings show that 22 (66.67%) teachers agreed that in-service ICT courses had improved student performance because of ICT integration, eight (24.24%) agreed that teaching with ICT tools was enjoyable as a result of in-service courses and three (9.09%) believed that using ICT tools in teaching and learning encouraged their students to use ICT tools.

In relation to how the in service course in ICT was relevant to the public primary school teachers, thirty one (65.96%) of the head teachers had a view that, the ICT in service

courses attended by their respective teachers had improved the pupils academic performance, 12 (25.53%) had a view that, the in service ICT courses attended by their respective teachers had made the teaching enjoyable while four (8.51%) viewed that, the in service courses had encouraged pupils to integrate ICT tools in teaching and learning. Summary of these findings are shown in table 4.16.

Table 4.15: Head teachers' responses on how the ICT in-service courses that their respective public primary school teachers attended were relevant for ICT integration in teaching and learning

Statement	Frequency (f)	Percentage
Pupils' performance improved	31	65.96
Teaching became enjoyable	12	25.53
Encouraged pupils to use ICT tools	04	08. 51
Totals	**47**	**100**

4.4.7: Responses from teachers regarding the areas of in service training they received for integrating ICT in teaching and learning in public primary schools

The respondents were asked to identify the ICT areas they had received training in. The results were as shown in table 4.17.

Table 4.16: Public primary school teacher responses regarding the areas of training they received for integrating ICT in teaching and learning

Areas teachers were trained in ICT	Frequency (f)	Percentage (%)
Computer software	16	34.04
Internet search engines	07	14.89
Recording and editing video teaching	03	06.38
Use of web resources in teaching	07	14.89
ICT educational pedagogy	04	08.51
Create smart board lessons	01	03 2.1
To integrate ICT in teaching and learning	02	04.26
Multimedia elements	04	08.51
Locate, retrieve and store information	03	06.38
Totals	**47**	**100**

The data in table 4.17 shows that, 34.04% of the teachers in public primary schools were trained in computer software, 14.89% were trained in computer skills, 6.38% were trained in recording and editing video teaching, 14.89% were trained in the use of web resources in teaching, 8.51% were trained in ICT educational pedagogy, 3.21% were trained on how to create smart board lessons, 4.26% were trained on how to integrate ICT in teaching and learning, 8.51% were trained on multimedia elements while 6.38% were trained in how to locate, retrieve and store information. The responses of the head teachers to this variable regarding the areas in ICT training received by their respective public primary school teachers are displayed in table 4.18.

Table 4.17: Head teacher responses on the areas in which their respective teachers received training for integrating ICT in teaching and learning in their respective public primary schools

Areas teachers were trained in ICT	Frequency (f)	Percentage (%)
Computer software	10	21.27
Internet search engines	05	10.64
Recording and editing video teaching	03	6.38
Use of web resources in teaching	08	17.02
ICT educational pedagogy	04	8.51
Create smart board lessons	02	4.26
To integrate ICT in teaching and learning	07	14.89
Multimedia elements	02	4.26
Locate, retrieve and retain information from a range of text and technologies	06	12.77
Totals	**47**	**100**

The data in table 4.18 indicate that, 10 (21.27%) of the head teachers of the sampled public primary schools reported that, their respective teachers were trained in computer software, 5 (10.64%) were trained in internet search engines, three representing 6.38% were trained in recording and editing video teaching, 8(17.02%) were trained on how to use web resources in teaching. The head teachers further reported that, 4 (8.51%) were trained in ICT educational pedagogy, 2 (4.26%) were trained on how to create smart board lessons, seven of them representing 14.89% were trained in how to integrate ICT in teaching and learning, 2 (4.26%) were trained in multimedia elements while six, accounting for 12.77% were trained in how to locate, retrieve and retain information.

4.4.8 Responses from teachers in public primary schools regarding the influence of their training in ICT for integration in teaching and learning

Three positive statements that asked respondents to rate themselves on a scale of Agree (1), Neutral (2) and Disagree (3) were used to gauge the influence of teachers' training on ICT integration in teaching and learning. The results are displayed in table 4.19.

Table 4.18: Responses from teachers in public primary schools regarding the influence of their training in ICT for integration in teaching and learning

	A		N		D	
Statement	**No**	**%**	**No**	**%**	**No.**	**(%)**
I have been trained in ICT to integrate ICT in teaching and learning	85	29.82	68	23.86	132	46.32
The training i received involved pedagogical aspect to integrate ICT in teaching and leaning	32	37.65	8	9.41	45	52.94
The training i received was adequate to integrate ICT in teaching and learning	27	31.76	3	3.53	55	4.71
A part from formal training, i have also been trained in teacher professional development to integrate ICT in teaching and learning	13	15.29	5	5.88	67	78.82

Table 4.19's findings show that, 132 (46.32%) of the teachers in public primary schools disagreed that they had received the necessary training to use ICT into teaching and learning. Among the teachers, 85 (29.82%) agreed that they had received ICT training so they could include it into their lessons, whereas 68 (23.86%) disagreed. Additionally, 45 (52.94%) of the teachers disagreed that the ICT training they had received did not include

a pedagogical aspect to integrate ICT in teaching and learning, while 32 (37.65%) of them agreed that the ICT training they had received did include a pedagogical aspect to do so. 9.41% of the teachers, a relatively modest number, were neutral. Concerning whether teachers had received professional development to integrate ICT in teaching and learning, a large percentage, (67), strongly had the view that, they had not received any professional development course. 55 (64.71% disagreed with the statement that the professional development course was inadequate. Of those, 27 (31.76%) were of the opinion that it was adequate, and only 3 (3.53%) were neutral.

4.5 Availability of Digital Devices and ICT Integration in Teaching and Learning in Public Primary Schools

The second objective of this study was to determine the influence of digital devices of computer facilities on ICT integration in teaching and learning in public primary schools in Kakamega County in Kenya. The information in this area was provided to determine whether public primary schools had the required digital devices to integrate ICT in teaching and learning. The question posed was: How does the availability of digital devices influence teachers' integration of ICT in teaching and learning in public primary schools in Kakamega County?

4.5.1 Public primary school teacher responses on availability of digital devices in their respective schools for ICT integration in teaching and learning

The public primary school teachers who participated in the study were asked to state whether or not their respective public primary schools had digital devices to integrate ICT in teaching and learning. This was done as per the category of public primary schools. Their responses were as given in the table 4.20.

Table 4.19: Public primary school teacher responses on whether their schools have digital devices for integrating ICT in teaching and learning

School category	Have digital devices	No digital devices	Total
Boarding	60 (89.55%)	7 (10.45%)	67 (100%)
Day school	22 (10.09%)	196 (89.91%)	218(100%)

$X^2 = 19.331$
P Value = 0.065

Table 4.20 indicates that, 60 (89.55%) of sampled public primary boarding schools had digital devices while only a small percentage, 7 (10.45%) did not have digital devices. 22 (10.09 %) of the public primary day schools had digital devices while 196 (89.91%) of the public primary day schools that were sampled did not have digital devices. A cross tabulation of digital devices against categories of public primary schools, public primary boarding schools scored higher than public primary day schools ($X^2 = 19.331$, df=0.05, P Value = 0.065). Head teachers were also asked whether their respective public primary schools had digital facilities for teachers to integrate ICT in teaching and learning process. Their responses were as shown in table 4.21.

Table 4.20: Primary school head teacher responses on availability of digital devices for integrating ICT in teaching and learning

School category	Have digital devices	Have no digital devices	Total (%)
Boarding school	60 (92.31%)	5 (7.69%)	65 (100%)
Day school	14(17.95%)	64 (84.05%)	78 (100%)

Table 4.21's responses demonstrate that, sixty (92. 31%) head teachers of public primary boarding schools, reported that their public primary schools had digital devices to integrate ICT into the teaching and learning process while 5 (7.69%) said that their respective public primary schools lacked these devices. 64 (84.05%) of the 78 head teachers of public primary day schools who were sampled said that their individual public primary schools lacked digital devices. Only 17.95% of the population in public primary day schools had access to digital devices.

4.5.2 Teacher responses on digital devices that were available in their respective public primary schools for integration of ICT in teaching and learning

The purpose of the study was to gather information from teachers regarding the digital devices that were available in their respective public primary schools for integration of ICT in teaching and learning. Table 4.22 summarizes the results.

Table 4.21: Teacher responses on digital devices that were available in their respective public primary schools for integration of ICT in teaching and learning

Digital device	Frequency (f)	Percentage (100%)
CDs	96	31.69
DVDs	67	23.60
Power point	102	33.79
You tube	17	05.96
Animation captions	00	00.00
Images	14	03.91
Smart boards	03	01.05
Totals	**285**	**100**

The results in Table 4.22 show that, 96 (31.69%) of the public primary school teachers reported that their public primary schools had CDs, 67 (23.60%) DVDs, 102 (33.79%) Power Point, 17 (5.96%) YouTube, 14 (3.91%) images and 3 (1.05%) smart boards to integrate ICT in teaching and learning. No teacher mentioned the digital device for animation captions at their particular public primary school. The study also gathered data from the sampled head teachers about the digital devices available in each public primary school. Table 4.23 represent their findings.

Table 4.22: Head teacher responses on the digital devices available to teachers in their respective public primary schools for ICT integration in teaching and learning

Computer facility	Frequency (f)	Percentage (100%)
CDs	32	22.38
DVDs	23	16.08
Power point	69	48.25
You tube	08	05.59
Animation captions	00	00.00
Images	07	04.90
Smart boards	04	02.80
Totals	**143**	**100**

Table 4.23 shows that, 32 accounting for 22.38% of the head teachers responded that, their public primary schools had CDs, 23 (16.08%) had DVDs, 102 (48.25%) had power points, 08 (5.59%) had You tube, 07 (4.90%) had images and 04 (2.80%) had smart boards to integrate ICT in teaching and learning. No head teacher indicated that their respective public primary school had animation captions digital device.

4.5.3 Adequacy of digital devices for ICT integration in teaching and learning in public primary schools

In order to determine whether the digital devices provided in public primary schools were adequate for integrating ICT in teaching and learning, the study surveyed teachers in those institutions. Table 4.24 displays the results of the study.

Table 4.23: Teacher responses on adequacy of digital devices available for ICT integration in teaching and learning in their respective public primary schools

Digital device	Frequency (f)	Percentage (100%)
CDs	97	34.03
DVDs	64	22.46
Projectors	70	24.56
You tube	28	9.83
Animation captions	00	00.00
Images	21	7.37
Smart boards	05	1.75
Totals	**285**	**100**

Table 4.24 reveals that, ninety-seven (34.03%) of the public primary school teachers reported to be having adequate CDs, sixty-four (22.46%) to be having adequate DVDs, seventy (24.56%) to be having adequate projectors, twenty-eight (9.83%) to be having adequate You tube, twenty-one (7.37%) to be having adequate images and only 05 (1.75%) of the public primary school teachers reported to be having smarts boards. None of the sampled public primary school teachers reported to be having animation captions. The study also collected data from the public primary school head teachers on whether the digital devices available in public primary schools were adequate. Table 4.25 displays their responses.

Table 4.24: Responses from head teachers regarding the adequacy of digital devices available for teachers' integration of ICT in teaching and learning in their respective public primary schools

Digital device	Frequency (f)	Percentage (100%)
CDs	51	35.66
DVDs	33	23.08
Projectors	35	24.48
You tube	12	8.39
Animation captions	00	00.00
Images	10	6.99
Smart boards	02	1.40
Totals	**143**	**100**

Results in table 4.25 shows that, 51 (34.03%) of public primary school head teachers reported to be having adequate CDs, thirty-three (23.08%) to be having adequate DVDs, thirty-five (24.48%) to be having adequate projectors, twelve (8.39%) to be having adequate You tube, ten (6.99%) to be having adequate images and only 02 (1.40%) of the public primary school head teachers reported to be having smarts boards. None of the sampled public primary school head teachers reported to be having adequate animation captions.

4.5.4 Public primary school teacher responses on digital devices for integration of ICT in teaching and learning that were missing in their respective public primary schools

Public primary school teachers who took part in the study were asked to indicate the digital devices that were missing for integration of ICT in teaching and learning in their respective public primary schools. They responded as shown in figure 4.7.

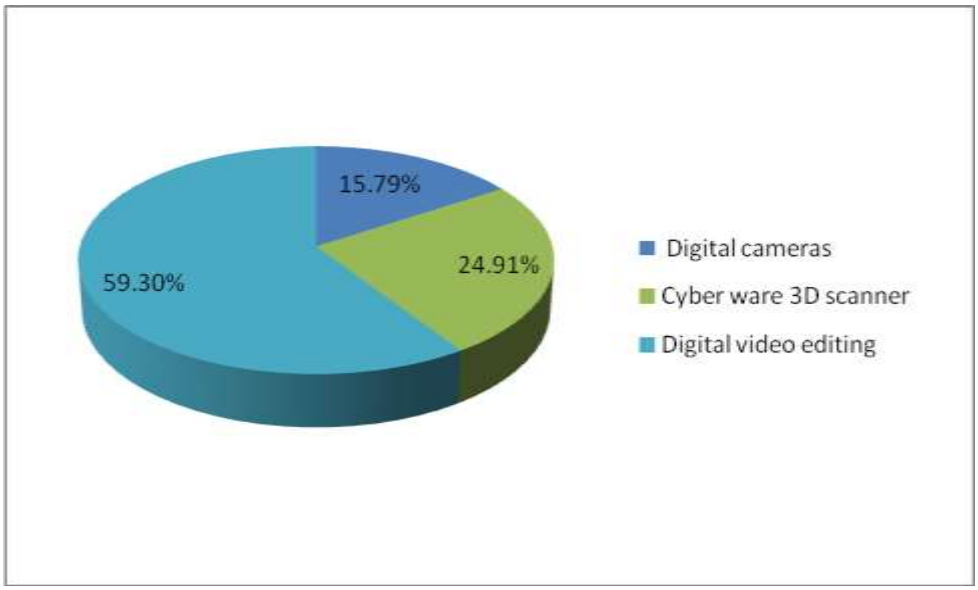


Figure 4.5: Public primary school teacher responses on digital devices for integration of ICT in teaching and learning that were missing in their respective public primary schools

Figure 4.7 shows that, 45 representing 15.79% public primary school teachers of the total reported missing digital cameras, 71 teachers representing 24.91% reported missing cyber ware 3D scanners and 169 teachers representing 59.30% reported missing digital video editing. The head teachers who participated in the study were also requested to provide information regarding the digital devices that were missing for teachers' integration of ICT in teaching and learning in their respective public primary schools. Table 4.26 displays the findings.

Table 4.25: Head teacher responses on digital tools that were missing for teachers' integration of ICT in teaching and learning in their respective public primary schools

Digital devices	Frequency (f)	Percentage (100%)
Digital cameras	13	9.09
Cyber ware 3D scanner	33	23.08
Digital video editing	97	67.83
Totals	**143**	**100**

Table 4.26 shows that, 97 (67.83%) of the public primary school head teachers reported that their respective public primary schools lacked digital video editing, 33 (23.08%) lacked cyber ware 3D scanner while only 13 representing 9.09% lacked digital cameras.

4.5.5 Appropriateness of digital devices available for integration of ICT in teaching and learning in public primary schools

Further, the public primary school teachers were asked to state whether or not the digital devices that were available for ICT integration in teaching and learning in their respective public primary schools were appropriate. The results are shown in Table 4.27.

Table 4.26: Teacher responses on appropriateness of digital devices available for ICT integration in teaching and learning in their respective public primary schools

Are the digital devices appropriate for Integration of ICT?	Frequency (f)	Percentage (%)
Yes	182	63.86
No	103	36.14
Totals	**285**	**100**

Table 4.27 Shows that, one hundred and eighty-two (63.86%) of the public primary school teachers reported that, the digital devices that were available were appropriate for integration of ICT in teaching and learning in their respective public primary schools while 103 (36.14%) reported that, the digital devices that available for ICT integration in teaching and learning in their respective public primary schools were inappropriate. Head teachers of sampled public primary school head teachers reported similar findings. Table 4.28 provides a summary of their findings.

Table 4.27: Head teacher responses on appropriateness of digital devices available for teachers use for integration of ICT in teaching and learning in their respective public primary schools

Are the digital devices appropriate for integration ICT?	Frequency (f)	Percentage (%)
Yes	98	68.53
No	45	31.47
Totals	**143**	**100**

Table 4.28 shows that, ninety eight (68.53%) of the public primary schools head teachers reported that, the digital devices that were available for teachers' integration of ICT in teaching and learning in their respective public primary schools were appropriate while 45 (31.47%) reported that the digital devices that were available for teachers' integration of ICT in teaching and learning in their respective public primary schools were inappropriate in their respective public primary schools were inappropriate for integration of ICT in teaching and learning.

4.5.6 Teacher responses on how often teachers integrate digital devices in teaching and learning in their respective public primary schools

The study sought to find out from the public primary school teachers how often they used ICT tools in teaching and learning. The results are displayed in table 4.29.

Table 4.28: Teacher responses on how often they used digital devices for integration of ICT in teaching and learning in their respective public primary schools

Digital device	Often Used	%	Sometimes	%	Seldom	%	Not used at all	%
CDs	84	29.47	54	18.95	10	3.51	03	1.05
DVDs	68	23.86	36	12.63	08	2.81	05	1.75
Power point	33	11.58	35	12.28	83	29.12	69	24.21
You tube	20	7.02	57	20.00	34	11.93	59	20.71
Animation captions	00	00.00	00	00.00	00	00.00	00	00.00
Images	37	12.98	50	17.54	70	24.56	70	24.56
Smart boards	43	15.09	53	18.60	80	28.07	79	27.72

From Table 4.29, 84 (29.47%) integrated CDs computer facility in teaching and learning more often, 54 (18.95%) integrated it sometimes, 10 (3.51%) seldom integrated it whereas only 03 (1.05%) did not use it at all. The table also indicate that, 68 (23.86%) of the teachers often integrated DVDs in teaching and learning, 36 (12.63%) integrated in sometimes, 08 (2.81%) use it seldom and 05 (1.75%) did not use it at all. In relation to power point, 33 accounting for 11.58% integrated it often, 35 (12.63%) integrated it sometimes, 83 (29.12%) use it seldom and 69 (24.21%) did not use it at all. 20 7.02%) of the teachers reported that, they often integrated You tube in teaching and learning, 57 (20.00%) integrated it sometimes, 34 (11.93%) integrated it seldom while 59 (20.71%) did not use at all. From the table, no teacher who participated in the study reported that they did integrate animations captions in their teaching and learning process.

Concerning the integration of images in teaching and learning, 37 (12.98%) teachers reported that, they integrated it often, 50 (17.54%) integrated it sometimes, 70 (24.56%) seldom integrated it in teaching and learning while 70 (24.56%) did not integrate it at all.

In relation to smart boards, 43 forming 15.09% of the teachers who participated in the study reported that, they integrated smart boards in teaching and learning process often, 53 accounting for 18.60% integrated it sometimes, 80 (28.07%) integrated it seldom while 79 (27.72%) did not integrate it all. The public primary school head teachers reported similar findings. Their findings are reported in table 4.30.

Table 4.29: Head teacher responses on how often their respective public primary school teachers integrated digital devices in teaching and learning

Digital device	Often Used	%	Sometimes	%	Seldom	%	Not used at all	%
CDs	52	36.36	47	32.87	36	25.17	08	5.59
DVDs	49	34.27	40	27.97	34	23.78	20	3.99
Power point	42	29.37	35	24.48	19	13.29	47	32.87
You tube	43	30.07	27	18.88	19	13.29	54	37.76
Animation captions	00	00.00	00	00.00	00	00.00	00	00.00
Images	20	13.99	28	19.58	34	23.78	61	42.66
Smart boards	06	4.20	19	13.29	62	43.36	56	31.16

From Table 4.30, 52 (36.36%) of the head teachers reported that, teachers in their respective public primary schools integrated CDs digital device in teaching and learning more often, 47 (32.87%) integrated it sometimes, 36 (25.17%) seldom integrated it whereas only 08 (5.59%) did not use it at all. The table also indicate that, 49 (34.27%) of the teachers often integrated DVDs in teaching and learning, 40 (27.97%) integrated it sometimes, 34 (23.78%) use it seldom and 20 (3.99%) did not use it at all. In relation to power point, 42 accounting for 29.37% integrated it often, 35 (24.48%) integrated it sometimes, 19 (13.29%) use it seldom and 54 (37.76%) did use it at all. 43 (30.07%) of the head teachers reported that, teachers in their respective public primary schools often integrated You tube in teaching and learning, 27 (18.88%) integrated it sometimes, 19

(13.29%) integrated it seldom while 54 (37.76%) did not use at all. From the table, no head teacher who participated in the study reported that, teachers in their respective public primary schools did not integrated animations captions in teaching and learning. Concerning the integration of images in teaching and learning, 20 (13.99%) of the head teachers who participated in the study reported that, teachers in their respective public primary schools integrated it often, 28 (19.58%) integrated it sometimes, 34 (23.78%) seldom integrated it in teaching and learning while 61 (42.66%) did not integrate it at all. In relation to smart boards, 06 forming 4.20% of the head teachers reported that, teachers in their respective public primary schools integrated smart boards in teaching and learning process often, 19 accounting for 13.29% integrated it sometimes, 62 (43.36%) integrated it seldom while 56 (31.16%) did not integrate it all.

4.5.7 Teacher responses on the extent to which the digital devices assisted in realization of the lesson objectives in the teaching and learning process in public primary schools

The study sought to find out the degree to which the digital devices aid in the achievement of the learning objectives. The findings are presented in table 4.31.

Table 4.30: Teacher responses on the extent to which the digital devices integration in teaching and learning assisted in realization of the lesson objectives in public primary schools

Digital device	Greater extent	%	Moderate extent	%	Less extent	%
CDs	94	32.98	74	25.96	13	4.56
DVDs	78	27.37	63	22.11	18	6.32
Smart boards	28	9.82	31	10.88	49	17.19
Power point	32	11.23	48	16.82	43	15.09
Captions	15	5.27	38	13.33	90	31.58
Hyperlinks	38	13.33	31	10.88	72	25.26
Computer						

The data collected from the public primary school teachers regarding the extent to which the various digital devices integrated in teaching and learning assisted in realization of the lesson objectives indicated that, ninety four (32.94%) of the teachers reported that the integration of CDs in teaching and learning had assisted in realization of lesson objectives at a greater extent, seventy four (25.96%) had the view that the integration of CDs in teaching and learning had assisted in realization of objectives at a moderate extent. Thirteen (4.56%) reported that integration of CDs in teaching and learning had led to realization of lesson objectives at a lesser extent.

Seventy eight (27.37%) of the teachers who participated in the study reported that, the integration of DVDs in teaching and learning had assisted in realization of the lesson objectives at a greater extent, sixty three (22.11%) of the teachers viewed that the integration of DVDs in teaching and learning had led to realization of lesson objectives at a moderate extent while eighteen (6.32%) of them reported that, the integration of DVDs in teaching and learning had assisted in realization of the lesson objectives at a lesser extent. In relation smart boards, twenty eight (9.82%) of the teachers reported that, the integration of smart boards in teaching and learning had assisted in realization of the lesson objectives at a greater extent, thirty one (10.88%) viewed that integration of smart boards in teaching and learning had assisted in realization of the lesson objectives at a moderate extent while forty nine (17.19%) of them argued that, the integration of smart boards in teaching and learning had assisted in realization of the lesson objectives at a lesser extent.

Concerning power point, thirty two (11.23%) of the teachers reported that, integration of power points in teaching and learning had assisted them in the realization of the lesson objectives at a greater extent, forty eight (16.82%) of them viewed that integration of power point in teaching and learning had assisted in realization of the lesson objectives at a moderate extent while forty three (15.09%) of the teachers claimed that, the integration of power point in teaching and learning had assisted in the realization of the lesson objectives at a lesser extent. A small number fifteen (5.27%) of the sampled teachers reported that, integration of captions in teaching and learning in primary schools had

assisted in realization of lesson objectives at a greater extent, thirty eight (13.33%) of them reported that, the integration of captions in teaching and learning had assisted in the realization of the lesson objectives at moderate extent while the highest number, ninety (31.58%) viewed that, integration of captions in teaching and learning had assisted in the realization of lesson objectives at a lesser extent.

Regarding hyperlinks computer, thirty eight (13.33%) of the teachers reported that, the integration of hyperlinks computer had assisted in the realization of the lesson objectives at a greater extent, thirty one (10.88%) said that the integration of hyperlinks computer had assisted in the realization of the lesson objectives at a moderate extent while seventy two (25.26%) had a view that the integration of hyperlinks computer had assisted in the realization of the lesson objectives at a lesser extent. The head teachers were also asked to state extent to which the computer facilities assist in realization of the lesson objectives. The results are presented in table 4.32.

Table 4.31: Head teacher responses on the extent to which the digital devices assisted teachers in realization of the lesson objectives in teaching and learning in their respective public primary schools

Digital device	Greater extent	%	Moderate extent	%	Less extent	%
CDs	28	19.58	19	13.29	11	7.70
DVDs	24	16.78	14	9.80	06	4.20
Smart boards	02	1.40	05	3.50	08	5.60
Power point	06	4.20	04	2.80	03	2.10
Captions	01	0.70	00	0.00	02	1.40
Hyperlinks Computer	03	2.10	05	3.50	02	1.40

From table 4.32, twenty-eight 19.58% of the head teachers reported that, integration of

CDs in teaching and learning had assisted in the realization of lesson objectives at a greater extent, nineteen (13.29%) viewed that integration of CDs in teaching and learning had assisted in realization of lesson objectives at a moderate extent. Eleven (7.70%) reported that integration of CDs in teaching and learning had led to realization of lesson objectives at a lesser extent. Twenty-four (16.78%) of the head teachers reported that, integration of DVDs in teaching and learning had assisted in realization of lesson objectives at a greater extent, fourteen (9.80%) of head teachers viewed that integration of DVDs in teaching and learning had led to realization of lesson objectives at a moderate extent while six (4.20%) of them reported that, integration of DVDs in teaching and learning had assisted in realization of lesson objectives at a lesser extent. In relation smart boards two (1.40%) of the head teachers reported that, integration of smart boards in teaching and learning had assisted realization of lesson objectives at a greater extend, five (3.50%) viewed that, the integration of smart boards in teaching and learning had assisted in the realization of the lesson objectives at a moderate extent while eight (5.60%) of them argued that the integration of smart boards in teaching and learning had assisted in the realization of the lesson objectives at a lesser extent.

Concerning power point, six (4.20%) of head teachers reported that integration of power points in teaching and learning had assisted them in realization of lesson objectives at a greater extent, four (2.80%) of them viewed that integration of power point in teaching and learning had assisted in realization of lesson objectives at a moderate extent while three (2.10%) of the head teachers argued that, the integration of power point in teaching and learning had assisted in realization of lesson objectives at a lesser extent. A small number, one (0.70%) of the sampled head teachers reported that integration of captions in teaching and learning in public primary schools had assisted in realization of lesson objectives at a greater extent, two (1.40 %) of them reported that, integration of captions in teaching and learning had assisted in realization of the lesson objectives at lesser extent. None of the sample head teachers reported that integration of captions had led to realization of lesson objectives at a moderate extent.

In relation to hyperlinks computer, three (2.10%) of the head teachers reported that, the

integration of hyperlinks computer had assisted in the realization of the lesson objectives at a greater extent, five (3.50%) said that the integration of hyperlinks computer had assisted in the realization of the lesson objectives at a moderate extent while two (1.40%) had a view that the integration of hyperlinks computer had assisted in the realization of the lesson objectives at a lesser extent.

4.6 Availability of Internet Connectivity and Integration of ICT in Teaching and Learning in Public Primary Schools

The third objective of the study was to look into how internet connectivity influenced integration of ICT in teaching and learning in public primary schools in Kakamega County in Kenya. The information in this section was provided to determine whether public primary schools in Kakamega County were connected to internet in order to integrate ICT into teaching and learning. The question that was posed was: What influence does internet connectivity have on teachers' integration of ICT in teaching and learning processes in public primary schools in Kakamega County?

4.6.1 Teacher responses on whether or not their respective public primary schools were connected to internet for ICT integration in teaching and learning

Teachers in public primary schools were asked whether their respective public primary schools had internet connectivity for ICT integration in the teaching and learning process. The results are provided in table 4.33.

Table 4.32: Teacher responses on whether or not their respective public primary schools were connected to internet for ICT integration in teaching and learning

Category of public primary school	Connected	Not Connected	Total
Boarding	51 (76.12%)	16 (23.88%	67 (100%)
Day	28 (12.84%)	190 (87.16%)	218 (100%)
X^2=14.249			
P Value =0.512			

From table 4.33, out of 67 sampled public primary boarding school teachers, fifty-one (76.12%) of them reported that, their public primary schools were connected to internet for teachers' integration of ICT in teaching and learning while sixteen (23.88%) of them said that their respective public primary boarding schools were not connected to internet. 28 (12.84%) of the public primary day school teachers reported that, their respective public primary schools were connected to internet while 190 (87.16%) of these categories of schools were not. Further computation indicated that, internet connection in public primary schools was not significantly different in public primary boarding schools than in public primary day schools (X^2 =14.249, P Value =0.512). In relation to this variable, the head teachers had similar views. Their findings are summarized in table 4.34.

Table 4.33: Head teacher responses on whether or not their respective public primary schools were connected to internet for teachers' integration of ICT in teaching and learning

Does your school have an internet connection?	Frequency (f)	Percentage (%)
Yes	42	29.37
No	101	70.63
Totals	**143**	**100**

Table 4.34 shows that, only forty-two (29.37%) of the public primary school head teachers reported that, their respective public primary schools were connected to internet for integration ICT in teaching and learning while one hundred and one (70.63%) were not.

4.6.2 Public primary school teacher responses on whether or not integrate internet in teaching and learning

Further analysis was computed on teachers' integration of internet in teaching and learning in public primary schools. The results are shown in table 4.35.

Table 4.34: Public primary school teacher responses on whether or not integrated internet in teaching and learning

School Category	Teachers integrating Internet in Teaching and learning		
	Yes	No	Total
Boarding	53 (79.10%)	14 (20.90%)	67 (100%)
Day	28 (12.84%)	190 (87.16%)	218 (100%)
X^2 =21.013			
P = Value =0.426			

Table 4.35 shows that, 53 (79.10%) of the public primary boarding school teachers reported that, they integrated internet in teaching and learning process whereas 14 (20.90%) of this category of public primary schools did not. 28 (12.84%) of the public day primary school teachers integrated internet in teaching and learning while 190 (87.16%) of the public primary day school teachers reported that, they were not integrating internet in their teaching and learning. Based on this findings, chi square computation showed that, the degree of integrating internet in teaching and learning in public primary schools was low as indicated by the respondents from both the teachers in day and boarding public primary schools (X^2 =21.013, df=0.005, P Value =0.426). About this variable, head teacher responses are summarized in table 4.38.

Table 4.35: Public primary school head teacher responses on whether or not their respective teachers integrated internet in teaching and learning

School Category	Teachers integrating Internet in Teaching and learning		
	Yes	No	Total
Boarding	41 (28.67%)	21 (14.69%)	62 (100%)
Day	18 (12.59%)	63 (44.06%)	81 (100)

Table 4.36 shows that, 41 constituting 28.67% of the public primary boarding school head teachers reported that, their respective teachers integrated internet in teaching and learning process whereas 21 (14.69%) of this category did not. 18 (12.59%) of the public primary day school head teachers reported that, their respective teachers integrated internet in teaching and learning. 63 (44.06%) of head teachers in this category of public primary schools reported that, their respective teachers were not integrating internet in their teaching and learning process.

4.6.3 Teacher responses on how their respective public primary schools accessed internet for teaching and learning

Teachers in public primary schools were asked about how frequently their respective public primary schools accessed the internet for teaching and learning. Their responses are depicted in figure 4.8.

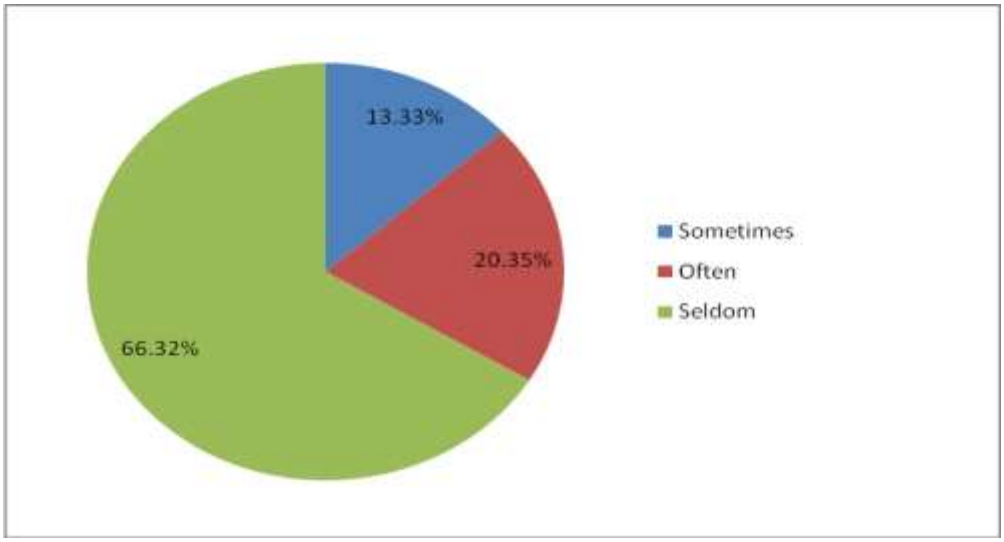


Figure 4.6: Teacher responses on how their respective public primary schools accessed internet for teaching and learning

The results in figure 4.8 shows that 13.33% of the teachers' accessed internet sometimes for teaching and learning, 20.35% accessed it often while 66.32% accessed it seldom. The public primary school head teachers were also asked to state how often their respective public primary school teachers accessed internet for ICT integration in teaching and learning. Table 4.37 shows how they responded.

Table 4.36: Head teacher responses on how their respective public primary school teachers accessed internet for teaching and learning

Computer facility	Frequency (f)	Percentage (100%)
Sometimes	44	30.77
Often	16	11.19
Seldom	83	58.04
Totals	**143**	**100**

From table 4.37, 44 (30.77%) of the public primary school head teachers reported that, their schools accessed internet sometimes, 14 (11.19%) accessed it often and 83 (58.05%) accessed it seldom.

4.6.4 Public primary school teacher responses on the means by which they mainly accessed internet for teaching and learning.

The study sought to identify the means used by teachers in public primary schools to access the internet for ICT integration in teaching and learning. The findings are depicted in Figure 4.9.

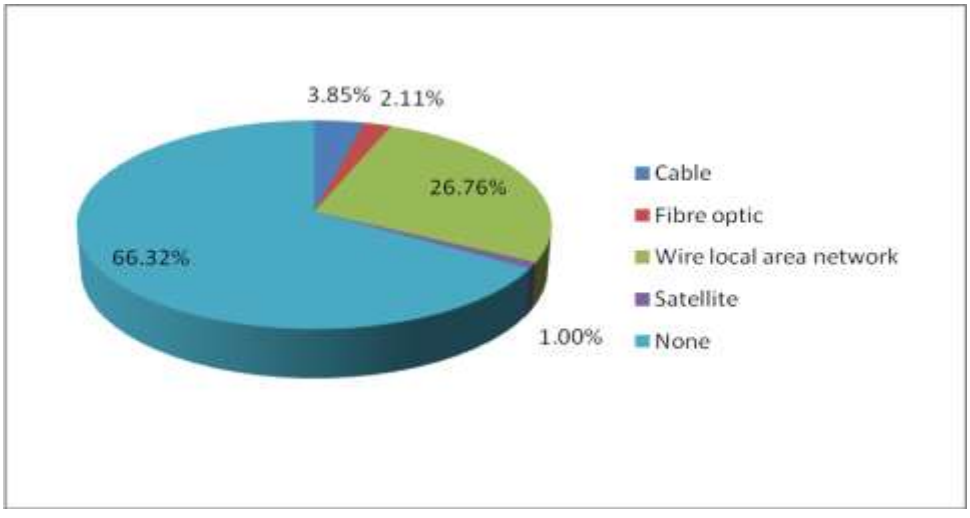


Figure 4.7: Teacher responses on the means by which their respective public primary schools accessed internet for teaching and learning

In regard to figure 4.9, 66.32% of the teachers used cables to integrate internet for teaching and learning, 26.72% reported that, they used local network as an internet means for integrating it in teaching and learning, 3.85% used cables as an internet means to integrate ICT in teaching and learning and, 1.00 used satellite as an internet means for integrating ICT in teaching and learning. In relation to this variable, head teacher responses were as shown in table 4.38.

Table 4.37: Head teacher responses on the means by which their respective teachers accessed internet for teaching and learning in public primary schools

Internet facility	**Frequency (f)**	**Percentage (100%)**
Cable	64	44.76
Fiber optic	20	13.98
Wireless local network	34	23.78
Satellite	25	17.48
None	00	0.00
Totals	**143**	**100**

Table 4.38 indicate that, 64 (44.76%) of the head teachers reported that, their respective public primary school teachers used cables to access internet for teaching and learning, 20 (13.98%) of the head teachers reported that their respective teachers used fiber optic means for integrating internet in teaching and learning, 34 (23.78%) reported that their respective teachers used wireless network as an internet means for integrating ICT in teaching and learning. 25 (17.48%) of respondents were of the view that, their respective teachers used satellite as an internet means for integrating ICT in teaching and learning.

4.6.5 Teacher responses on how they integrated internet in various activities for teaching and learning in their respective public primary schools.

Teachers in public primary schools were asked for their thoughts on how they used the internet for both teaching and learning in their respective public primary schools. Their responses are shown in Table 4.39.

Table 4.38: Teacher responses on how they integrated internet in various activities for teaching and learning in their respective public primary schools.

Internet activity	Never		Several times		At least once a week		Every day	
Sending and reading e-mail	05	1.75%	173	60.70%	29	10.18%	78	27.37%
Reading and watching news	10	3.51%	173	60.70%	42	14.74%	60	21.05%
Searching online practical Information	02	0.70%	195	68.42%	37	12.98%	51	17.89%
Using online dictionary or Encyclopedia	48	16.84%	102	35.79%	59	20.70%	76	26.67%
Searching different sources of information and learning about a particular topic you're interested in	02	0.70%	192	7.37%	39	13.68%	53	18.60%
Taking part in online group discussion or forums	16	5 .61%	122	42.82%	69	24.21%	78	27.37%

Table 4.39 indicate that, 05 (1.75%) of the teachers reported that they never used internet for sending and reading e-mail, 173 (60.70%) used it several times, 29 (10.18%) used it at least once a week while 78 (27.37%) used it every day. In relation to reading and watching news, 10 (3.51%) of the public primary school teachers reported that they never used it, 173 (60.70%) used it sometimes, 42 (14.74%) used it at least once a week while

60 (21.37%) used it every day. 02 (0.70%) of the public primary school teachers reported that, they never used internet for searching online practical information, 195 (68.42%) used it several times 37 (12.98%) used it at least once a week whereas 51 (17.89%) used it every day. 48 (16.84%) of the public primary school teachers reported that, they never used internet for online dictionary or encyclopedia, 102 (35.79%) used it sometimes, 59 (20.70%) used it at least once a week while 76 (26.67%) used it every day.

Regarding searching different sources of information and learning about a particular topic they were interested in, 02 (0.70%) never used it, 192 (7.37%) used it several times, 39 (13.68%) used it at least once a week while 53 (18.60%) used it every day. 16 (5.61%) never used it for taking part in online group discussion or forums, 122 (42.82%) used it sometimes 69 (24.21%) used it at least once a week whereas 78 (27.37%) used every day. Table 4.40 displays the responses of the head teachers of public primary schools concerning this variable.

Table 4.39: Head teacher responses on how their respective public primary school teachers integrated internet for various activities in teaching and learning process.

Internet activity	**Never**		**Several times**		**At least once a week**		**Every day**	
Sending and reading e-mail	03	2.10%	07	4.90%	02	1.40%	06	4.20%
Reading and watching news	03	2.10%	08	5.59%	05	3.50%	10	6.99%
Searching online practical Information	01	0.70%	02	1.40%	04	2.80%	05	3.50%
Using online dictionary or Encyclopedia	06	4.20%	14	9.79%	10	6.10%	21	14.69%
Searching different sources of information and learning about a particular topic you're interested in	01	0.70%	02	1.40%	04	2.80%	06	4.20%
Taking part in online group discussion or forums	01	0 .70%	05	3.50%	10	6.10%	07	4.90%

Table 4.40 indicate that, 3 (2.10%) of the head teachers reported that, they never used internet for sending and reading e-mail, 7 (4.90%) used it several times, 2 (1.40%) used it at least once a week while 06 (4.20%) used it every day. In relation to reading and watching news, 3 (2.10%) of the public primary school head teachers never used it, 8(5.59%) use it sometimes, 5 (3.50%) used it at least once a week while 10 (6.99%) used it every day. 1 (0.70%) of the public primary school head teachers reported that, they never used internet for searching online practical information, 02 (1.40%) used it several times 4 (2.80%) used it at least once a week whereas 5 (3.50%) used it every day. 6 (4.20%) of the public primary school head teachers reported that, they never used internet for online dictionary or encyclopedia 14 (9.79%) used it sometimes, 10 (6.10%) used it at least once a week while 21 (14.69%) used it every day. Regarding searching different sources of information and learning about a particular topic they were interested in, 1 (0.70%) never used it, 2 (1.40%) used it several times, 4 (2.80%) used it at least once a week while 6 (4.20%) used it every day. 1 (0.70%) never used it for taking part in online group discussion or forums, 5 (3.50%) used it sometimes 10 (6.10%) used it at least once a week whereas 7 (4.90%) use every day.

4.7 Public Primary School Teacher Perceptions and Integration of ICT in Teaching and Learning

The fourth objective of this study sought to find out the influence teacher perceptions toward information communication technology on integration of information communication technology in teaching and learning in public primary schools in Kakamega County? Data collected in this section was meant to get information on teacher perceptions regarding integration of information communication technology in teaching and learning in public primary schools in Kakamega County. The question that was asked was: What is the influence teacher perceptions toward information communication technology on integration of information communication technology in teaching and learning in public primary schools in Kakamega County?

What is the relationship between teacher perceptions of ICT integration and integration of ICT in teaching and learning in public primary schools in Kakamega County?

4.7.1 Perceptions of public primary school teachers towards integration of ICT in teaching and learning

Public primary school teachers were asked to indicate whether they agree or disagree with characteristics concerning the influence of teachers' integration of ICT in teaching and learning in public primary schools by ticking in the box that represents their views appropriately. They responded as shown in table 4.41.

Table 4.40: Perceptions of public primary school teachers toward integration of ICT in teaching and learning

Statement	Agree (1)	Neutral (2)	Disagree (3)	X^2 value and P value
Integration of ICT improves teaching and learning	192 (67.37%)	78 (27.375%)	15 (5.26%)	13.254 (p=0.652)
Use of ICT improves Quality of education	187 (65.61%)	68 (23.86%)	30 (10.53%)	10.256 (P=0.002)
ICT integration is enjoyable and stimulating	187 (65.61%)	68 (23.86%)	30 (10.53%)	10.256 (P=0.002)
Integration of ICT put more work on the shoulders	71 (24.91%)	59 (20.70%)	155 (54.39%)	8.256 (P=0.004)
ICT tools may be difficult Use in teaching and learning	23 (8.08%)	18 (6.32%)	244 (85.61%)	11.254 (P=0.002)
integration of ICT in teaching And learning improves pupils critical thinking	102 (35.79%)	98 (34.39%)	85 (29.82%)	13.254 (P=0.352)
Integration of ICT in teaching and learning enhances remedial instruction	97 (34.04%)	69 (24.22%)	119 (41.755%)	7.127 (P=0.001)
Knowledge on how to integrate ICT in teaching and learning is a worthwhile skill	145 (50.88%)	07 (2.46%)	33 (11.58%)	5.891 (P=0.154)
Integration of ICT in teaching and learning is useful for teachers' work preparation	215 (75.44%)	39 (13.68%)	31 (10.88%)	9.246 (P=0.003)

Table 4.41 indicate that, one hundred and ninety-two (67.37%) of the teachers reported that, integration of ICT in teaching and learning improved in public primary schools in all subject areas, fifteen (5.26%) disagreed with this factor while 78 (27.37%) neither agreed nor disagreed with this statement. One-hundred and eighty-seven (65.61%) of teachers had a view that, use of ICT in teaching and learning improved the quality of education, sixty-eight (23.86%) of the teachers were neutral. Thirty (10.53%) disagreed with this factor. The statement, integration of ICT in teaching, realized similar results and learning could be enjoyable and stimulating. Seventy-one (24.91%) of teachers reported that, integration of ICT in teaching and learning put more work on the shoulders of teachers.

Concerning the statement that, ICT tools may be difficult to use in integration in teaching and learning, twenty-three (8.07%) agreed with the statement while eighteen (6.32%) were neutral, 244 (85.61%) disagreed with this statement. In relation to integration of ICT in teaching and learning improves pupils critical thinking, one hundred and two (35.79%) agreed with this statement, ninety-eight (34.39%) were neutral while eighty-five (29.82%) disagreed with this statement. With respect integration of ICT in teaching and learning enhances remedial instruction, ninety-seven (34.04%) agreed with the statement, sixty-nine (24.22%) were neutral while one hundred and nineteen (41.75%) disagreed with the statement. One hundred and forty-five (50.88%) of teachers reported that, knowledge on how to integrate ICT tools in teaching and learning was worthwhile skill, thirty-three (11.58%) disagreed with the statement whereas seven (2.46%) were neutral. Two hundred and fifteen (75.44%) viewed that integration of ICT in teaching and learning was useful for teachers work preparation, thirty-nine (13.68%) were neutral while thirty-one (10.88%) disagreed with this statement. Knowledge on how to integrate ICT tools in teaching and learning is worthwhile skill were the only perceived to have a relationship noted to have significant chi- square values as (x^2=5.891, df=0.005, P=0.154). Table 4.42 displays the responses from head teachers concerning this variable.

Table 4.41: Perceptions of respective public primary school head teachers towards teachers' integration of ICT in teaching and learning

Statement	Agree (1)	%	Neutral (2)	%	Disagree (3)	%
Integration of ICT improves teaching and learning	27	18.89	11	7.69	05	3.50
Use of ICT improves quality of education	18	12.59	06	4.20	10	6.99
ICT integration is enjoyable and stimulating	10	6.99	03	2.10	05	3.50
Integration of ICT put more work on the shoulders	00	0.00	01	0.70	02	1.40
ICT tools may be difficult use in teaching and learning	02	1.40	01	0.70	05	3.50
Integration of ICT in teaching and learning improves pupils critical thinking	05	3.50	01	0.70	03	2.10
Integration of ICT in teaching and learning enhances remedial instruction	02	1.40	00	0.00	04	2.80
Knowledge on how to integrate ICT in teaching and learning is a worthwhile skill	05	3.50	00	0.00	02	1.40
Integration of ICT in teaching and learning is useful for teacher's work preparation	09	6.29	00	0.00	06	4.20

Table 4.42 indicate that, twenty-seven (18.89%) of the head teachers reported that integration of ICT improves teaching and learning in public primary schools in all subject areas, five (3.50%) disagreed with this factor while 11 (7.69%) neither agreed nor disagreed with this statement. Eighteen representing 12.59%) of the head teachers had a view that the use of ICT in teaching and learning improved the quality of education, six (4.20%) of them were neutral. Ten (6.99%) disagreed with this factor. Ten, representing 6.99% that integration of ICT in teaching and learning could be enjoyable and stimulating. Three (2.10%) were neutral on this statement while 5 (3.50%) disagreed with this statement. Two (1.40%) of the head teachers disagreed with statement that integration of ICT in teaching and learning put more work on the shoulders of teachers. One (0.70%) of the sampled head teachers were neutral whereas none of sample head teachers agreed with this statement.

With regard to the statement that ICT tools may be difficult to use in integration in teaching and learning, two (1.40%) agreed with the statement, one (0.70%) were neutral while five representing 3.50% disagreed with this statement. In relation to integration of ICT in teaching and learning improves pupils critical thinking, five representing 3.50% agreed with this statement, one (0.70%) were neutral while three representing 2.10% disagreed with this statement. In regards to Integration of ICT in teaching and learning enhances remedial instruction, two (1.40%) agreed with the statement, four representing 2.80% disagreed with this statement while none of them was neutral. Five representing 3.50% agreed with the statement that, knowledge on how to integrate ICT tools in teaching and learning was worthwhile skill, two (1.40%) disagreed with the statement whereas none of them was neutral. Nine (6.29%) had a view that, integration of ICT in teaching and learning is useful for teachers work preparation, six (4.20%) disagreed with this statement while none of them was neutral.

CHAPTER FIVE

5.0 DISCUSSION AND INTERPRETATION OF THE RESEARCH FINDINGS

5.1 Introduction

This chapter discusses and interprets the findings that were presented and analyzed in chapter four of this study. The discussions and interpretations are based on the data provided by public primary school head teachers and public primary school teachers focusing on the study objectives. The results from the two questionnaires, helped in answering the research questions. Important information from the researcher's interview with the County's Director of Education in Kakamega County was used in the discussion of the findings to support the questionnaire responses. The discussion also draws upon other scholars' input on similar issues. The findings of this study were discussed and interpreted in light of theoretical and conceptual framework that was discussed in chapter two.

5.2 Teacher Training in ICT and Integration of ICT in Teaching and Learning Public Primary Schools

The first question was concerned about what influence does teacher training in information communication technology has on how information communication technology is integrated into teaching and learning in public primary schools in Kakamega County? From the findings of this study, it was revealed that, teachers training in ICT influences the integration of ICT in teaching and learning. Therefore, teachers need to receive ICT training in order to properly integrate it in teaching and learning. However, it is evident from the teacher and head teacher responses in tables 4.7 and 4.8 respectively that, 14.93% of boarding and 64.22% of day public primary school teachers in Kakamega County were not trained in ICT for integration of ICT in teaching and learning. This implied that, these teachers were not integrating ICT in teaching and learning. These findings concur with a report by Owalabi (2013) who found that, less than 10% of primary and secondary school teachers in Nigeria had computer training. The findings of the Kenya Institute of Curriculum Development (KICD, 2018) also support this study's findings. According to them, only a small percentage of public

schools were using ICT tools to improve teaching and learning, even though some of them were equipped with technology through the digital literacy program and other sources. This was attributed to teachers' incompetence or resistance to integrating ICT into the teaching and learning process. These findings are further agreeing with Mehari, et-al (2020) who found that, majority of biology teachers lacked the essential skills and formal training to integrate ICT into their practices of teaching and learning. They had also received inadequate training in computer literacy. Mwunda and Ogutu (2018) findings which showed that secondary schools in Nakuru County were still lagging behind in their use of ICT in the teaching and learning process also agrees with these results. One of the major factors contributing to this condition was the lack of ICT teacher training, among other reasons.

The level of ICT integration that teachers use in their classroom teaching and learning is heavily influenced by their ICT academic background. According to studies, teachers with greater ICT degrees are more likely than those with lower ICT qualifications to adopt and use technology in the classroom. According to research, teachers with Master's or PhD degrees in ICT have better digital literacy than those with a first degree or diploma in ICT, making them more suited to integrate ICT in teaching and learning. It is abundantly clear from the responses in figure 4.5 and table 4.9 that, most teachers (67.37 %) were untrained in ICT. This was followed by certificate in ICT holders constituting 23.51%. Only 9.12 % of teachers had a Diploma in ICT as their highest level of professional training. Professionally trained teachers are expected to have acquired the necessary subject content and pedagogy in ICT than those who were not trained in ICT. Thus, these results implied that, ICT integration in teaching and learning was minimal. This was also in line with the overarching tenet of TPACK, which is a way of thinking about the knowledge teachers need such as computer literacy and subject matter in order to integrate technology effectively into their classrooms. These results are consistent with those of Papaioannou and Charalambors (2011) who found that among others, although principals had a positive attitude toward ICT, the study found a number of statistically significant differences regarding academic qualifications in ICT for teaching and learning.

A large percentage of teachers do not integrate ICT in teaching and learning, according to the reports from teachers and head teachers in tables 4.10 and 4.11. These statistics imply that, there is little influence from teachers' integration of ICT in teaching and learning. These findings agree with Manduku et al (2012) assertions that majority of schools in Kenya are not effectively adopting and utilizing ICT in teaching and learning. In addition, Laaria (2013) found that despite the efforts of many stakeholders and the importance of ICT in education, the National ICT Policy on Education of 2006 had not been properly realized as anticipated. Despite the fact that ICT usage in teaching and learning in schools had increased by over 41% in a number of nations, Laaria (2013) asserted that Kenya had not yet attained that level.

Teacher professional development in ICT greatly influences integration of ICT in teaching and learning in public primary schools. Teachers who have undergone teacher professional development courses in ICT integrate ICT in teaching and learning than those who have not. The study's findings in table 4.12 showed that, 56.72% of teachers in public primary schools with boarding facilities had taken an in-service ICT course. Further analysis revealed that all types of schools considerably underrepresented teachers who had taken in-service ICT courses ($X^2 = 7.156$, df = 0.05, P = 0.001). The responses from the head teachers in table 4.13 revealed a close relationship between ICT integration and teachers' integration of ICT in teaching and learning in public primary schools. The results indicate that, many of these teachers did not have in-service training to increase their ICT skills, in spite of the fact that most of them had certifications in ICT and many of them worked in public primary boarding schools. These results imply that teachers' integration of ICT in teaching and learning in public primary schools in Kakamega County was minimal.

These findings therefore agree with Dussedorf (2016) who asserted that, in Germany, teachers frequently pay a portion of the cost of professional development programs due to schools' limited financial resources. As a result, many teachers miss professional development opportunities. These results support those from Mandina (2015) who revealed that, a lack of in-service training in the subject was the greatest obstacle to

incorporating ICT in teaching and learning. These findings however, disagree with the European Commission (2010) who observed that, as a reward for taking part in professional development activities, teachers in the Czech Republic have access to 12 paid workdays each academic year and the development strategy of the school must also include a plan for the teachers' professional growth. As a result, the significant aid initiatives in the Czech Republic many teachers have undergone teacher professional development courses (European commission, 2010).

The relevance of in-service training has an influence on how effectively teachers integrate ICT in teaching and learning. Teachers who thought the in service courses they took were relevant readily integrated ICT in their teaching and learning more than those who did not. The study findings, which are presented in table 4.14 revealed that, while a small percentage of public primary school teachers claimed that their in-service training in ICT was irrelevant to incorporating ICT in teaching and learning, the majority of them indicated that the in service training in ICT was pertinent. The sampled head teachers of public primary schools in table 4.15 shared similar opinions about the relevance of the in-service ICT courses that their individual public primary school teachers had taken. A small number of the sampled public primary school head teachers claimed that, the in-service courses their respective teachers had taken were irrelevant while majority of them said that their respective teachers' in-service training was relevant. Based on the study's findings, it was expected that teachers in public primary schools in Kakamega County would integrate ICT to enhance teaching and learning process. This was due to the fact that, the majority of respondents stated that the in-service training sessions the public primary school teachers had taken were pertinent. Ghavifekr and Rosdy's (2015) findings that, teachers' professional development was essential for enhancing pupils' academic performance are consistent with these results. Jean and Arcand (2010) findings also agree with the findings of this study. The study found that, ICT training for teachers had improved their self-confidence and ability to instruct young people in Tanzania.

The in-service training that teachers receive in ICT learning areas has a significant impact on how they integrate ICT in teaching and learning. Compared to teachers who only

trained in one ICT area, those who were trained in various relevant ICT areas embraced ICT in teaching and learning far more widely. Majority of teachers were only trained in one computer software package, according to the study's findings in tables 4.17 of the teachers and 4.18 of the head teachers' responses. These findings were further confirmed by the County Director of Education's comments, who remarked,

‘‘Most of the public primary school teachers are ICT illiterate. Most of them are trained in micro soft computer word package such as typesetting, saving the document and printing. They have little or no knowledge on other ICT packages such as internet search engines, recording and editing, video teaching, use of web resources in teaching, ICT educational pedagogy, create smart board lessons and to integrate ICT in teaching and learning which are important for integration of ICT in teaching and learning’’. (An interview with the County Director of Education). These results concur with Sulemana et al. (2018) who observed that ICT could be a powerful tool in the classroom when properly utilized by qualified teachers. ICT makes teaching and learning more effective by motivating students more. For instance, using ICT in the classroom can make it easier to explain difficult words and concepts.

5.3 Availability of Digital Devices and ICT Integration in Teaching and Learning in Public Primary Schools

The second question sought to find out how does teachers' integration of information communication technology in teaching and learning in public primary schools in Kakamega County depend on the availability of digital devices? The findings of this study indicated that, the availability of digital devices was a critical factor in teachers’ integration of ICT in teaching and learning in public primary schools. The availability of digital devices is a precondition for the successful integration of ICT in teaching and learning in schools. Even some of the more tech-averse teachers develop an interest in the digital resources and eventually act. Accordingly, the second objective of this study sought to determine the influence availability of digital devices on integration of ICT in teaching and learning in public primary schools in Kakamega County in Kenya. Information on availability of digital devices in public primary schools in Kakamega

County were provided by teachers and head teachers in tables 4.20 and 4.21 respectively. The findings of the study revealed that, majority of public primary schools lacked digital devices. Further analysis of the results indicated that, the situation was worse in public primary day schools than in public boarding schools. In a cross-tabulation of the availability of digital devices against categories of public primary schools, public primary boarding schools outperformed public primary day schools (X^2 = 19.331, df=0.05, P Value = 0.065). These results show that, public primary school teachers in Kakamega County were not integrating ICT in teaching and learning due to lack of digital devices. These findings agree with Murithi and Jin (2021) who found that school ICT infrastructure were deficient. This had made it difficult to integrate technology into the competency-based program. These findings disagree Market Data Retrieval (2016) who asserted that, in the United States, ICT technology was utilized in schools considerably more frequently than in other countries, according to the 2017 Genius Newsletter. From 2005 to 2015, there were fewer students per computer from 63:1 to 6:1. Teachers in developed nations are therefore better able to integrate ICT into their teaching and learning.

The provision of digital devices influences teachers' integration of ICT in teaching and learning. Lack of certain digital devices in schools may impede the effective integration ICT in the classroom. The study's participants were asked to list the digital devices that were available in their respective public primary schools. The study's findings in tables 4.22 and 4.23 revealed that, CDs and DVDs made up the majority of the computer resources in public primary schools. This might be as a result of them being less expensive. This was followed by a power point facility, a You tube facility, an image facility and a smart board facility for ICT integration in classroom instruction. No computer facility for animation captioning in their particular public primary school was mentioned. The results of this study implied that, teachers in public primary schools in Kakamega County were not integrating ICT in their teaching and learning process because they lacked a variety of computer resources. These findings are in agreement with that of Nwana et al (2017) who found that, there were insufficient ICT teaching resources. It was also found that teachers were not utilizing some ICT resources, even

though they were available. As reported by 94.0 percent of teachers, the most readily available materials were computers, followed by audio and video discs (83.3%), scanners (83.3%), printers (87.0%), flash memories (82.0%), and printers (83.3%). The following materials were in short supply: electronic white board (4.0%), multimedia projector (5.3%), e-graphics (3.0 %), power bank devices (8.0 %) and programmed instructional materials (6.0 %).

The availability of adequate digital devices teachers' integration of ICT in teaching and learning. The study findings, which were presented in tables 4.24 and 4.25, showed that, teachers in public primary schools in Kakamega County were not integrating ICT in their teaching and learning due to a lack of adequate digital devices. The findings of Ndidde et- al. (2009) who highlighted that, even while institutions made every effort to provide the appropriate equipment and infrastructure, the ratio of computers to students was still relatively high, particularly in teacher training schools with a 1:15 ratio agrees with the findings of this study. The study additionally revealed that access to computers is restricted for teachers and administrators. In particular, teachers were to share their laptops with the students. Albirin (2016) report also support the findings of this study. The results showed that 57.6% of respondents had computers at home, compared to 33.4 percent of respondents who had access to computers at school. The results of the study by Nokiri et al. (2021) also support the findings of this study. According to the findings, because computer equipment and software were so expensive, there was little investment in ICT infrastructure. Sanja (2014) study's results revealed that, all of the participating schools only had a small number of computers with a wide range of application software installed at random, including word processing, database, spreadsheet and presentation software. Telephones, mobile phones, radios and televisions were additional ICTs that were accessible in the classrooms. The study also revealed that, while students in private (academy) schools used the computer labs, teachers' accessed computers primarily from the staffroom.

Teacher ICT integration in teaching and learning is highly influenced by lack of certain digital devices. Teachers who lack digital devices cannot effectively integrate ICT in

teaching and learning. The study findings in in figure 4.7 of the teachers and table 4.26 of the head teachers showed that teachers lack digital devices for integration of ICT in teaching and learning. These findings imply that teachers cannot integrate ICT in teaching and learning. These findings agree with that of Amuchie (2015) who found that, there was very little use and availability of ICT resources. The majority of teachers rated the availability of most ICT infrastructure, including desktop computers (75.0%), laptops (100.0%), televisions (94.6%), video players (98.2%), digital cameras (100.0%), interactive white boards (100.0%), multimedia projectors (100.0%), and others, as extremely poor. It was also found that exorbitant cost of computers and accessories, prevented people from using ICT.

ICT integration is influenced by how often teachers integrate it in teaching and learning in public primary schools. The amount of information taught and learned in schools relies on how frequently teachers integrate ICT in their classes. Teachers who use the digital devices in the classroom on a regular basis develop positive attitudes toward the use of ICT in teaching and learning and develop into technology experts. The study's findings, in tables 4.29 and 4.30 of the reports for teachers and head teachers indicated that, more teachers integrated CDs and DVDs more often than any other kind of digital device. The County Director of Education in Kakamega County was questioned to further determine why CDs and DVDs were favored to any other computer facility. He said in response,

“CDs and DVDs are easy to use because teachers simply use the students to fix them and leave them to watch the recorded programs as they continue with their own things. One does not need technical skills to operate them and the students do not have to wait for them to come to class, they watch, discuss and revise on their own”. (An interview with the County Director of Education)

Form these findings, it implies that the high use of CDs and DVDs in teaching and learning may be due to their affordability and marketability relative to other computer resources. These findings demonstrated that, teachers in public primary schools rarely used digital devices in teaching and learning because most teachers integrated CDs and

DVDs more often than any other kind of digital device. The findings agree with a study by Albirini (2016) who found that, many teachers preferred utilizing CDs and DVDs because they believed they could be made quickly and were readily available. Sibanda et al (2016) findings however, contradicts the findings of this study. According to the study, projectors, email, e-learning apps, networks, wireless technologies, computers, TVs, radios, interactive boards, email, and video conferencing were a few of the technologies that were mostly used in teaching and learning. Most ICTs, including computers, interactive whiteboards, and projectors, were found to be insufficient by the research. Njathi et al (2018) study found that mere 23.5% of principals stated they used computers on a daily basis. Taking into account the work that the government and other organizations had done to guarantee computer use in school administration, this was a very small percentage. Obota et al (2015) study found that the two most common ICT facilities were radios and computers. Nevertheless, the available radios were inadequate and the average computer to learner ratio was 30:1.

Integration of ICT in teaching and learning influence the extent to which lesson objectives are achieved. Digital devices can assist teachers in achieving their learning objectives if they are used effectively. The study's findings indicated that, the integration of computer technology in teaching and learning had significantly aided in the achievement of the lesson's objectives. According to table 4.31 findings, teachers used CDs and DVDs the most digital devices to accomplish the objectives of the lesson. Similar results were demonstrated by the head teachers' report in table 4.30. These findings imply that the extent to which integration of digital devices influence the achievement of lesson objectives was minimal because CDs and DVDs were the most digital devices that were integrated in teaching and learning. These results agree with Mathipa's (2014) assertion that schools and other educational institutions cannot continue to be the main or only destinations where knowledge is transmitted from teacher to student in light of the expansion of information. This makes the case that in order to ensure efficient, ongoing and lifelong learning, schools must encourage the use of technology to acquire knowledge and skills (Mathipa, 2014).

5.4 Availability of Internet Connectivity and ICT Integration in Teaching and Learning in Public Primary Schools

The third question was concerned about what influence does internet connectivity have on teachers' integration of ICT in teaching and learning in public primary schools in Kakamega County? Availability of internet connectivity was considered an important factor since schools which were connected to internet were better placed in integrating ICT in teaching and learning than schools which were not connected to internet. Schools should be connected to an internet to enable teachers integrate ICT in teaching and learning. In schools with internet connectivity, teachers are encouraged to integrate ICT in teaching and learning. The findings of this study revealed that, most public primary schools were not connected to internet hence the teachers' integration of ICT in teaching and learning not well done. According to the study's findings in tables 4.33 of teachers' and 4.34 head teachers' reports, 87.16 % of Kakamega County's public primary schools were not connected to internet. This shows that teachers' integration of ICT for teaching and learning relatively low. Compared to public primary boarding schools, the situation at public primary day schools was worse. Further research revealed no significant relationship between public primary boarding schools and public primary day schools in terms of internet connectivity ($X^2 = 14.249$, df = 0.005, P = 0.511).

These findings are consistent with those of Sekiguchi (2011) who found that just 10% of Japanese schools had internet connectivity, which was a relatively low number and may be considered one of the major barriers to teachers integrating ICT in teaching and learning in primary schools. These findings however disagree with Frank (2011) who found that majority of Ghanaian schools, particularly boarding schools, had internet access. QED Educational Technology Trends (2012) also contradict the findings of this study. The findings indicate that Schools in industrialized nations have far greater internet connectivity than those in developing nations. In the USA, schools are becoming more and more online. According to a survey by the US National Centre for Educational Statistics (2015) the proportion of schools with internet connectivity increased from 35% to 72% in 2014.

Teachers' integration of ICT in teaching and learning is influenced by how often internet accessed. The study's findings in tables 4.35 and 4.36 of the teachers' and head teachers' responses respectively clearly demonstrated that, 79.10 % of public primary school teachers did not integrate internet into their lessons. Chi square analysis of the responses from teachers at day and boarding public primary schools revealed that, there was a significant relationship between type of school and internet connection (X^2 =21.013, df= 0.005, P Value =0.426). These findings however contradict the Mwalongo (2011) who claimed that, teachers used ICT in a variety of ways in teaching, management, professional development and personal usage.

Oghenetega and Mercy (2014) study agrees with the findings of this study. According to the study, a large proportion of survey respondents were experienced computer users who routinely visited cybercafés to access the internet. The most popular online materials used by students were e-books and journals and most students gave internet academic activities an average evaluation. Students may also have internet access to pertinent academic resources. The study also found that the internet had improved students' preparation for the exam. Additionally, it was found that, there were a number of issues preventing effective internet access in higher educational institutions in Nigeria. This included power outages, slow internet connections, a shortage of computer terminals and information overload brought on by too many hits and a lack of computers.

ICT integration in teaching and learning is influenced by how frequently teachers integrate internet in teaching and learning. Results from figure 4.8 showed that, majority of teachers comprising of 66.32 % seldom accessed internet for ICT integration in teaching and learning in public primary schools. This imply that, the influence of ICT integration in teaching and learning in public primary schools is minimal. These findings are contrary to a study by Frank (2011) who found that; majority of Ghanaian schools had internet access. Less than 15% of teachers used the internet in creative ways to enhance teaching and learning. More than 30% of the teachers, according to the report, used computers as their main research instrument. Less than 25% of the students used it for learning and research, compared to less than 40% who used it for entertainment.

Additionally, it was found that using computers and the internet has simplified finding answers to questions, finishing tasks and learning about the histories of various cultures.

Concerning the means by which public primary school teachers accessed internet for ICT integration in teaching and learning, results in figure 4.9 reveals that, a large population of 66.32% accessed internet for ICT integration in teaching and learning through cables. This was followed by wireless local area network at 26.76 %. This implied that, ICT integration in teaching and learning was moderately carried out. These findings are inconsistent with GoK's (2011) assertions that, providing students with computer access to the internet enhanced their networking with learning communities via websites like wikis, google groups, web 2.0 technologies (classroom 2.0), Facebook, classroom blogs, Twitter, and Ning, among other educational social networks. The findings further agree with Kajal (2023) who asserted that, users prefer popular search engines like Google and Yahoo over others because they provide quick, easy access to a multitude of information.

The influence of ICT integration on teaching and learning depends on how public primary school teachers used internet in various activities for teaching and learning. Results in table 4.39 of the teachers and table 4.40 of the head teachers. The findings of the study showed that, teachers typically utilized the internet in their classrooms to receive and send email as well as take part in online groups or forums. Practical information searches, information searches across several sources and learning about a particular topic of interest were the least frequent uses of the internet in schools. The implication of these findings is that, the influence of ICT integration in teaching and learning was minimal. These finding agree with a study by Musa (2018) who found that, most participants used the internet for academic purposes. This was followed by those who use it for searching news. An average amount of respondents used the internet for communication, while slightly more than half used it for gaming. A very small percentage of teachers used social networks on the internet. The research concluded that by ensuring that there is easy access to ICT facilities that provide internet services, the Ministry of Education and Vocational Training, in collaboration with college principals, should promote internet access and use of teacher colleges.

5.5 Teacher perceptions and ICT integration in teaching and learning

The fourth question aimed at finding out what is the influence of teacher perceptions toward information communication technology on integration of information communication technology in teaching and learning in public primary schools in Kakamega County? Teachers' perceptions toward integration of ICT in teaching and learning was considered a vital factor in determining whether teachers can adopt and use technology in teaching and learning or not. Teachers with positive perceptions about ICT are likely to embrace it in teaching and learning than those teachers who have negative perceptions about it. The findings from this study depicted that, although most teachers had positive perceptions on ICT integration in teaching and learning, majority of them were not integrating it in teaching and learning due to various reasons. Among them include: lack training in ICT, lack of internet, lack of computer facilities among others.

The study's results in in tables 4.41 for teachers and 4.42 of head teachers revealed that, a large population of 75.44 % of teachers viewed that integration of ICT in teaching and learning was useful for teachers work preparation. 67.37% and 65.61 % of the teachers also had the opinion that, integration of ICT had improved the teaching and learning and had improved the quality of education respectively in public primary schools. The findings further revealed that, ICT integration makes teaching and learning enjoyable and engaging for students and aids in the development of their critical thinking. These findings imply that, majority of primary school teachers were positive about the ICT influence both teaching and learning. The Chi square test showed a significant relationship between teachers' perceptions toward ICT and ICT integration in teaching and learning (X^2=5.891, df=0.005, P=0.154). These findings agree with a study done by Manduku (2012) who found that, teachers were quite enthusiastic about using ICT in the classroom. Additional support for these findings was provided by the study by Luhumbo (2015) who found that, even while majority of teachers had positive perceptions toward using ICT, integration would only be successful if all teachers had ICT training since it would influence their perceptions. Moreover, Miima (2013) found that, although while majority of Kiswahili teachers were aware of the benefits of integrating ICT into their classes, they were reluctant to do so for a variety of reasons. David and Paola (2012) also

supported these findings. Accordingly, as a result of being able to see how the ICT program was to help both the teachers and the students, the study indicated that teachers were enthusiastic about its adoption in the classroom. They also believed that the development of learning machines (technology) had aided them in changing their methods of instruction and implementing fresh ideas. Jane (2018) asserted that, as evidenced by their technical, operational, and conceptual knowledge as well as their familiarity with social/ethical, pedagogical and professional issues, the study found that, Filipino teachers in the Bula District were amenable to utilizing ICT in the classroom.

CHAPTER SIX

6.0 CONCLUSIONS, RECOMMENDATIONS AND SUGGESTIONS FOR FURTHER STUDIES

6.1 Introduction

This chapter provides conclusions of the study, recommendations and suggestions for further studies. The general objective of this study was to investigate the influence of integration of information communication technology on teaching and learning in public primary schools in Kakamega County. The study was guided by the following objectives: to assess the influence of teacher training in information communication technology on integration of information communication technology in teaching and learning, determine the influence of availability of digital devices on integration of information communication technology in teaching and learning, establish the influence of internet connectivity on integration of information communication technology in teaching and learning and to examine the influence teacher perceptions on integration of information communication technology and integration of information communication technology in teaching and learning in public primary schools in Kakamega County.

6.2 Conclusions

Based on the aforementioned findings, it was established that most teachers in public primary schools lack training in ICT in Kakamega County. This hinders integration of ICT in teaching and learning. The study also concludes that, although some teachers had basic ICT knowledge through in service training, there is a challenge in ICT integration due to inadequate pedagogical knowledge on ICT integration. The study further concludes that, though in service training in ICT received by teachers was relevant, it was insufficient to enable teachers integrate ICT in teaching and learning. From the findings, it was established that teacher training in ICT greatly influenced integration of ICT in teaching and learning in public primary schools in Kakamega County. It was also established that teachers with prior training in ICT integrated ICT in teaching and learning frequently compared to those without any training.

Based on the findings, the research established that most public primary schools in Kakamega County lacked digital devices for integration of ICT in teaching and learning. The study also concludes that, there were inadequate digital devices available for ICT integration in teaching and learning in public primary schools in Kakamega County. The available digital devices available for ICT integration were evidently strained. The study further concludes that, there have been considerable efforts by schools and teachers to integrate digital devices in teaching and learning in public primary schools in Kakamega County. From the findings it was further concluded that, Radios and Computers were the main digital devices used in public primary schools. It was established that, these digital devices were mostly used for sourcing information and teaching vocabularies. From the findings, the digital devices were mainly applied to search for and present content rather than facilitate innovative methods of teaching such as autonomous learning. This scenario has diminished the influence of ICT integration in teaching and learning.

Based on the results obtained, the affirms that internet connectivity significantly influenced integration of ICT in teaching and learning. However, the results revealed that, majority of public primary schools in Kakamega County have a challenge of internet connectivity. This negatively impact on teachers' integration of ICT in teaching and learning. These impacts are exacerbated by inequalities in internet connectivity among day and boarding schools in Kakamega County in Kenya.

From the findings, it was concluded that, although teachers in public primary schools in Kakamega County had positive perceptions toward ICT integration in teaching and learning, they were not doing so due to other constrains. This negatively impacted on level ICT integration in teaching and learning in public primary schools in Kakamega County.

In general, integration of ICT in teaching and learning in public primary schools in Kkamega County in Kenya is moderately done. However, teachers have been slow in ICT uptake due to teachers' lack of training in ICT, lack of digital devices and internet connection in public primary schools in Kakamega County. These factors have resulted

to a very low level of ICT integration in teaching and learning. Therefore, integration of ICT in teaching and learning in public primary schools is an area that still needs a lot of commitment and investment if it is to yield better results. There is also need to continuously improve ICT infrastructure in public primary schools as it is even changing.

6.3 Recommendations

The following recommendations were made based on the findings and conclusions made on objective one:

i. In order to improve ICT integration in teaching and learning in public primary schools in Kakamega County and the entire country, the government should consider making ICT a core learning area at pre service training level in order to enable them integrate it in teaching and learning.
ii. The teachers' employer (TSC) should make ICT literacy one of the minimum requirements for recruitment. This will motivate teachers train in ICT.
iii. The study further recommends that, the government through the Ministry of Education should organize frequent compulsory in service training in ICT in order to equip all teachers with appropriate skills and knowledge in ICT.

Based on objective two and three, the study recommends the following:

i. The government should explore the possibility of entering into partnerships with sponsors like Computer for Schools Kenya (CFSK), NEPAD and other legalized Development Partners in equipping public primary schools with adequate digital devices and increase the number of schools benefiting from the grants so as to raise funds for purchasing digital devices for schools and connecting public primary schools to the internet. Access to digital devices and the internet is a prelude to successful adoption of ICT for teaching and learning.
ii. All public primary schools should be provided with high quality ICT infrastructure so that the digital divide can be bridged between those who have and those who don't have the ICT resources.
iii. The government should also provide teachers with digital devices and broadband internet connection packages at affordable rates and installment conditions. This

is because they do not have enough time to prepare for ICT related content while they are at school, provided with such, they can do it from home.

Based on the fourth objective of the study, the following recommendations are made:

i. Public primary schools should adopt policies that guide structured integration of ICT in teaching and learning. One of the policies that can be adopted is adoption of appraisal practices that reward teachers who endeavor to use ICT in teaching and learning process in addition to outlining ICT competency standards for the teacher trainers.
ii. The government should also consider making ICT a core subject in the primary school curriculum because it is an important factor in vision 2030 and the Millennium Development Goals. The country will be ICT equipped as the schools will be ICT hubs. This will develop positive teachers' perceptions towards integrating ICT in teaching and learning.

In general, the government through the Ministry of Education should consider the need to have clear policy guidelines teachers training in ICT and effective commitment to teachers' use of digital devices in ICT integration in teaching and learning. Further, more sensitization workshops are needed to deflect the negative perceptions and also increase appreciation of ICT integration in teaching and learning.

6.4 Suggestions for Further Studies

Based on the delimitation of this study, the following suggestions were made for consideration of further studies:

i. Future studies should be done in other parts of Kenya and in private primary schools to test the replicability of the study findings.
ii. Design another study to establish the relationship between teachers based factors and integration of ICT in teaching and learning in primary schools. It would be interesting to compare how well they perform in terms of pedagogical challenges.
iii. This study was only limited to descriptive survey design; further studies need to be carried out using different sampling methods and data collection methods.

REFERENCES

Abbas, W. T., Madzorera, I., Apraku, E. A., & Fawzi, W.W. (2021). ‘’Perceptions about English as second language. Teachers’ technology base teaching in Pakistan: Attitudes, uses of technology and challenges’’ International conference on emerging technologies and intelligent system (Cham: springer), 315-325.doi\\;10.1007/978-030-82616-1-28.

Abuya, K. (2019). *Kenya Government Axes Class 1 Laptop Project for computer Labs.* Retrieved from https://techweez.com/2019/02/25/jubilee-laptop-project-axed/

Akram, H., & Yang, Y. (2021). Implementation causers on educational policies in Pakistan. *International Journal of Humanities Innovation.* 4(1),25-28.

Albirini, A. A. (2016). Teachers’ Attitudes toward Information and Technology. The case of Syrian EFL Teachers. *Journal of Computers and Education*, 47,373-398.

Allan, B., & Teevan, J. J. (2005). *Social Research Methods*. New York: Oxford University Press.

Amuchie, A. A. (2015). Availability and utilization of ICT resources in teaching and learning in secondary schools in Ardo-Kola and Jalingo, Taraba State, Nigeria. *Journal of Poverty, Investment and Development, 8,* 94-100.

Asad, M. M., Wadho, M., Khand, Z., & Hussain, N. (2020). Integration of e learning technologies for teaching and learning process: an empirical study on higher institutes of Pakistan. *A journal of Research in Higher Education doi: 10.11 08/JARHE-04-2020-1103.*

Babbie, E. (2014). *The basics of social research* (6thed.). Belmont, CA: Wadsworth, Cengage Learning.

Balanskat, A., & Gertsch, C. A. (2010). Review of national curricula and assessing digital competence for students and teachers: findings from 7 countries. *Brussels: European schoolnet.*

Beri, N., & Sharma, L. (2019). Teachers’ attitude towards integrating ICT in teacher education. *International Journal of Innovative Technology and Exploring Engineering, 8(8),* 285-295.

British Educational Suppliers Association (BESA) (2011). *Information and Communication in UK schools.* London URL.

Bukky, O. O. (2013). A survey of internet access and usage among undergraduates in African University. *Journal of International and library, 3(8), 4-12.*

Cohen, L., Marion, L., & Morrison, K. (2012). *Research Methods in Education (6th Ed.).* London: Routledge Falmer.

Cohen, L., Marion, L., & Morrison, K. (2018). *Research Methods in Education (8th Ed.).* London: Routledge Falmer.

Coles, S., & Scior, K. (2012). Public attitudes towards people with intellectual disabilities: A qualitative comparison of white British and South Asian people. *Journal of Applied Research in Intellectual Disabilities,* 25, 177-188. doi:10;1111/j.1468-3148.2011. 00655.x

Creswell, J. (2012). *Qualitative inquiry and research design: chasing among five approaches.* London: SAGE.

Creswell, J. (2014). *Qualitative inquiry and research design: choosing among five traditions.* London: SAGE.

Creswell, J. (2009). *Research Design: Qualitative, Quantitative and Mixed Methods Approaches.* London: SAGE.

Cuben, L. (2011). *Oversold and Underused Computers in the Classroom*. Cambridge: Harvard University Press.

Daniel, O. A., Zainab, A.A., Fredrick, S., & Rebecca, A. A. (2019). *ICT integration in The teaching and learning of Business Management in the Senior High School in Sekondi-Takoradi Metropolis.* Unpublished B.Ed. in Management project, University of Cape Coast.

Dussedorf, J. (2016). Technology integration barriers: Urban school mathematics teachers' perspectives. *Journal of Science education and technology,* 20(1): 17-25.

Enu, J., Nkum, D., Ninsin, E., Diabor, C. A., & Korsah, D. P. (2018). Teachers' ICT skills and ICT usage in the classroom: The case of basic school teachers in Ghana *Journal of Education and Practice,* 9(20), 35-38. Retrieved from www.iiste.org

Ertmer, P. A. (2012). Teacher pedagogical beliefs: The final frontier in our quest for technology integration? *Journal of educational technology,* vol.53 (4), 25-39.

European Commission (2013). *Survey in schools: ICT in Education Benchmarking Access, use and Attitudes to Technology in Europe's Schools*. Luxemburg: European Union.

Frank, W. K., Litell, J. H., Corcoran, J. & Pillai, V. (2011). The use of computers and internet as a supplementary source of educational material: A case study of primary schools in Tema metropolis in Ghana. *Journal of contemporary educational technology,* 2 (2), 105-115.

Gay, L. R., Mills, G. E., & Airasian, P. (2009). *Educational research: competencies for analysis and applications (10th ed*.). New Jersey: Pearson Education.

Ghavifekr, S., Razak, A. Z., Ghani, M. F. A., Ran, N. Y., Meixi, Y., & Tengyue, Z. (2019). ICT integration in education: Incorporation for teaching and learning improvement. *The Malaysian Online Journal of Educational Technology,* 2(2), 24-45. Retrieved from www.mojet.net

Ghavifekr, S., & Rosdy, W. A. W. (2015). Teaching and learning ICT in schools. *International journal of research in education and science, (IJRES),* 1 (2), 175-191.

Hitach, M. (2009). *Basic Education Curriculum Framework*. Nairobi: Government printer.

Jane, D. J. (2018). *Mathematics and science teachers' competencies toward the information and communication technology integration in the classroom teaching.* Unpublished M.A. Thesis: Partido State University, Goa, Camarinas Sun.

Jasmasyah, M. (2022). Empowering students integrated language skills through the use of teachers learning videos in blended learning class. *Indonesian EFL Journal,* 9(1), 53-62.

Jean, P., & Arcand, M. (2010). Perceptions about ICT for teaching, professional development, administration and personal use. *International journal of education and development using Information and communication technology,* 7 (3), 1008-1018.

Jogezai, N. A. (2021). Teachers' attitudes towards social media use in online amid the COVID 19 pandemic: the effects of social media use by teachers and religious scholars during physical distancing. He.7: e0678 doi 10. 1016/j.heliye

Kamaruddin, K., Abdulla, A., Idris, M. N., & Nawi, M. N. M. (2017). Teachers' level of ICT integration in teaching and learning: A survey in Malaysian private preschool. *AIP Conference Proceedings 1891,* 020075. Retrieved from https://doi.org/10.1063/1.5005408

Kenya National Bureau of Statistics (KNBS). (2022). Kenya population and housing census: Population and household distribution by social economic characteristics. *KNBS Publication,* Volume 17.

Khochen, M., & Radford, J. (2012). Attitudes of teachers and head teachers towards inclusion in Lebanon. *International Journal of Inclusive Education,* 16(2), 139-153.

KICD (2018). *Basic education curriculum framework.* Nairobi: Government printer.

Kusano, K., Frederiksen, S., Jones, L., & Kobayashi, M. (2013). The effects of ICT environment on teachers' attitudes and technology integration in Japan and the U.S.A. *Journal of Information Technology Education,* 12, 29-43.

Laaria, M. (2013). Leadership challenges in the implementation of ICT in public secondary schools, Kenya. *Journal of Education and Learning,* 2(1), 32-43.

Langat, A. C. (2015). Barriers hindering implementation, innovation and adoption of ICT in primary schools in Kenya. *International journal of innovative research and development*, 4 (2), 1-11.

Lee, K., & Lee, M. (2015). Influence of integration on interactivity in social media luxury brand communities. *Journal of Business Research,* vol. 3 (9), 422-429.

Luhombo, C.S. (2022). *Teacher factors influencing integration on ICT in public primary schools in Mumias sub-county, Kenya*. Unpublished M.Ed. Thesis, University of Nairobi.

Lin, S. (2017. Analysis of students learning satisfaction in social community supported computer principles and practice course. *Eurasia journal of Mathematics, Science Technology Education.* 14, 849-858.

Liu, S., Kang, L., Fang. J., Liu, Z., Yang, Z., Sun, J., (2021). Computer supported collaborative concept mapping: the impact of students' perceptions of collaboration on their knowledge understanding and behavioral patterns. *Journal of international environment,* 9, 169-184. Doi 10.1080/10494820.2021.

Manduku, J., Kosgey, A. & Sang, H. (2012). *Adoption and use of ICT in enhancing management of public secondary schools:* a survey of Kesses zone district, Uasin Gishu County, Kenya.

Mariga, G., Ogega, S., Shikali, C., & Muliaro, J. (2017). Computer laptop project for basic education schools in Kenya. *International Journal of Information and Communication Technology Research,* 7(5). http://repository.seku.ac.ke/handle/123456789/3541

Marshall, S. & Rossman, W. (1989). *Designing qualitative research.* Newbury Park, CA: Sage.

Mathipa, E. R. (2014). Teacher factors influencing the use of ICT in teaching and learning in South African urban schools. *Mediterranean journal of social sciences,* 5 (23), 147 - 154.

Mbithe, F. (2016). *Factors influencing teacher participation in integration of ICT in teaching and learning in public secondary schools in Machakos Sub-County* (Unpublished M.Ed Thesis). South Eastern Kenya University.

Mehari, T. B., David, W. K. & Bennard, C. M. (2020). Teachers' skills for ICT integration in Teaching and Learning Biology in secondary schools in the Southern Region in Eritrea. *African journal of education and practice,* 6 (4), 44-61.

Miima, A. F. (2016*). Integration of ICTs in teaching and learning of Kiswahili language in public secondary schools in Kakamega County in Kenya.* Unpublished Masters project report. Kenyatta University.

Mishira, P. and Koehler, P. (2008). What is technological pedagogical content knowledge (TPACK)? *Contemporary issues in technology and teacher education,* 9 (1), 107.

MoEVT (2015). *National Information and Communication Technologies Policy* Retrieved from htt://www.tanzania.go.tz/pdfict policy.pdf

Market Data Retrieval, (2019). *Policy framework for reforming education for sustainable development.* Nairobi: Government Press.

MOEST. (2018). *Kakamega County school census report*. County Education Officer, Kakamega.

Mugenda, M. O. & Mugenda A. G., (2003). *Research Methods*: *Quantitative and Qualitative Approaches.* Nairobi: Africa Centre for Technology Studies Press.

Mugenda, O. M. & Mugenda, A.G. (1999*). Research Methods, Quantitative Approaches*. Nairobi: Africa Centre for Technology Studies Press.

Muinde, S. M. and Mbataru, P. (2019). Determinants of implementation of public sector projects in Kenya: A case of laptop project in public primary schools in Kangundo Sub County, Machakos County. *International academic journal of law and society,* 1 (2), 328-252.

Mulei, K. S. (2019). Implementation of the new curriculum (2-6-3-3-3) in Kenya. *IOSR Journal of Business and Management,* 21(5), 67-71.

Murithi, J. & Jin, E. Y. (2021). Teachers' use of ICT in implementing the competency based curriculum in public primary schools. Retrieved from https://doi.org/io.1186/s42862-021-00012-0

Musa, C. (2018). Access and use of internet in teaching and learning at two selected teachers' colleges in Tanzania. *The international journal of education and development using information and communication technology,* 14(2), 4-16.

Mwunda, N. M. and Ogutu, J. (2018). An investigation of factors influencing the integration of ICT in teaching and learning process in public secondary schools in Machakos County in Kenya. *International journal of economics, commerce and management,* 6 (4), 418-441.

Mwalango, A. (2011). The challenges facing the integration of ICT in teaching and learning activities in South African Rural secondary schools. *Mediterranean journal of social sciences,* vol. 5(20), (1087-1097).

Ndidde, A. N., Lubega, J., Buhikwa, D. & Baguma, G. (2009). *Uganda report in T. Karsenti (Ed.), The Pan African Research Agenda on the pedagogical integration of information and communication technologies* in Ugandan Education Institutions, Makerere University*: phase 1 National reports* (pp 55-75*). Otiawa: DRC*

Ngumbo, H. (2006). *Guidelines on special study paper (SSP).* Nairobi: Kenya Institute of Special Education.

Njathi, S. N., Ngaruiya, B., & Maithya, P. (2018). Influence of principals' perception of computers on their use in administration of public secondary schools' in Kiambu County, Kenya. *European Scientific Journal,* 14(31), 178-190.

Nokiri, L., Lisa, H. and Stigmar, H. (2014). Teacher educators use of digital tools and needs for digital competence in higher education. *Journal of digital learning in teacher education,* 35 (4), 203-220.

Nuhu, K. M. & Onojah, A. O. (2021). Effect of webinar multimedia platform on students' academic performance in selected educational technology concepts in University of Ilorin. *Journal of Indonesian multidisplinary Res,* 2 (1), 9-20.

Nurhabibah, P. et al. (2018). ICT literacy competence among vocational high school teachers. *Journal of information,* 6(4), 134-173.

Nwana, S. E., Ofoegbu, T. O., & Egbe, C. I. (2017). Availability and Utilization of ICT Resources in Teaching Computer Education in Secondary Schools in Anambra State, Nigeria. *Mediterranean Journal of Social Sciences,* 8(5), 111-116. Doi: 10.1515/mjss-2017-0029.

Nzwili, K. M. (2017). Perception of teachers and principals on ICT integration in the primary school curriculum in Kitui County, Kenya. *European Journal of Education Studies,* 3(7), 408-430. Doi.10.5281/zenodo.824829.

Nyaga, N. S. (2014). *Challenges facing effective ICT implementation in selected public secondary schools in Nakuru North District, Nakuru County.* Unpublished M. Ed. Thesis, Kenyatta University.

Obota, B. N., Oluoch, S. E., & Makani, L. (2015). An Assessment of the Availability of ICT Infrastructure for Curriculum Instruction in Public Secondary Schools in Mumias Sub-County, Kenya. *IOSR Journal of Research & Method in Education,* 5(1), 52-57. Retrieved from www.iosrjournals.org

Odhiambo P. (2012). Reforming education to align it to 2010 constitution in Kenya. Nairobi: Government Press.

Oghenetega, I. & Mercy, A. (2014). Impact of internet on academic performance of students in tertiary institutions in Nigeria. *Journal of information and knowledge management*, 5(2), 157-172.

Olowafemi, I. B. (2016). *The internet system and services.* Abuja: Pandaf press Ltd.

Orodho, J.A. (2008*). Techniques of Writing Research Proposals and Reports in Education and Social Sciences.* Maseno: Kanezja Hp Enterprises.

Orodho, J. (2005). *Elements of Education and Social Sciences Research Methods*, Kanezja Publishers, Kenya.

Owalabi, O. T. et al (2013). Teacher education, Information and Communication Technology prospects and challenges of e- teaching profession in Nigeria. *American journal of humanities and social sciences,* 1 (2), 1-18.

Ovan, G. C. (2014). Digital Dilema: Issues of Access, Cost and Quality in Media enhanced Distance Education. *ASHE-ERIC Higher Education Report,* 27(95), 483-510.

Ozturk, I. H. and Anal, S. (2012). Barriers to ICT integration into teachers' classroom practices: Lessons from a case study on social studies teachers in Turkey. *World Applied Sciences Journal,* 8(7), 176-185.

Pakistan Ministry of Education (2018). *National educational policy 2018*. Islamabad: Government of Pakistan.

Poala, K. & David, J. (2012). Evaluation of the use of ICT within primary education in Malawi. *Journal of educational technology and society,* 1(2), 302-317.

Papaioannou, P. & Charalambous, K. (2011). Principals' attitudes towards ICT and their perceptions about the factors that facilitate or inhibit ICT integration in primary schools of Cyprus. *Journal of Information Technology Education,* 10, 349-369.

Ran P., Abdul-Razak, R. & Hajar, H. (2023). Investigating the factors affecting ICT integration of in service teachers in China. *A journal of human and social sciences communications,* 10(4), 380-392.

Rok, M. (2013). *Education Sector Report, Medium Term Expenditure Framework 2013/14-2015/16.* Nairobi: Government printer.

Sanja, M. M. (2014). Investigation of information communication technology in Kenyan primary sector. *Journal of emerging trends in computing and information sciences*. Vol, 5 (7), 205-215.

Saunders, M., Lewis, P. & Thornhill, A. (2007). *Research Methods for Business Studies (3rd Ed.).* Great Britain: Prentice hall.

Sekiguchi, R. (2011). *An example of the change of education in the information society in Japan*. In proceedings from the sixteenth congress of the Germany society for education science. http;// www. Erzwiss.

Seufert, S., Guggemos, J. & Sailer, M. (2021). Technology related knowledge, skills and attitudes of pre and in service teachers: the current situation and emerging trends. *Journal of computer and human behavior,* 39(2), 273-315.

Sibanda, M., Mapenduka, W. & Furusa, S. (2016). Assessment of the availability and utilization of ICTs for teaching and learning in secondary schools - case of a high school in Kwekwe, Zimbabwe. *International Journal of Scientific & Technology Research,* 5(5), 282-288.

Simin, G. & Wan, A. W. (2015). Teaching and learning with technology: Effectiveness of ICT integration in secondary schools in Malaysia. *International journal of research in education and science,* 1 (2), 176-190.

Singh, T. K. R. & Chan, S. (2014). Teacher readiness on ICT integration in teaching-learning: A Malaysian case study. *International Journal of Asian Social Science,* 4(7), 874-885.

Sulemana, A., Anyanful, V. K., & Abdulai, I. B. (2018). The relationship between teachers' ICT knowledge and availability of ICT facilities in the junior high schools: A case study in the Savulugu District in the Northern Region of Ghana. *International Journal of Innovative Research & Development,* 7(6), 7-10. DOI:10.24940/ijird/2018/v7/i6/JUN18006

Sutter, F. & Kihara, A. (2019). Determinants of successful implementation of digital literacy project in public primary schools in Baringo County, Kenya. *Journal of Entrepreneurship and Project Management,* 4(1), 96-117. Retrieved from www.carijournals.org

Tekya, E. & Asare, Y. (2016). A survey of Information Communication Technology literacy among lecturers. *Information and Knowledge Management*, 6(8), 1-7.

Thaheem, S. K., Abdic, M. J., Mirza, Q. & Pathan, A V. (2021). Online teaching benefits and challenges during pandemic COVID 19: A comparative study of Pakistan and Indonesia. Asian Education and Development Studies. Retrieved from: https://doi.org/10.1108/AEDS-08-2020-0189

Tziafetas, K. (2013). Views of ICT *t*eachers about the introduction of ICT in primary education. *The online journal of education technology,* vol.12 (10).

UNESCO, (2013). *UNESO ICT Competency Framework for teachers*. Paris: UNESCO.

UNESCO, (2013). *Information Communication Technology (ICT) in education in five Arab states. A comparative analysis of ICT integration and e readiness in schools in Egypt, Jordan, Oman and Qatar.* UNESCO https://uis.uneso.org/sites/default/files/information-and-communication

United Republic of Tanzania (2009). *A framework for ICT use in teacher professional development in Tanzania.* Dar es Salaam: Ministry of Education and Vocational Training.

Van Teijilingen, E. R., Rennie, A. M., Hudley, V. and Graham, W. (2011). The importance of conducting and reporting pilot studies: the example of Scottish Birth Survey. Journal of advanced nursing, 34(3), 289-295.

Wanzala, O. & Nyamai, F. (2018). *Big hurdles thwart Jubilee's laptops plan.* Retrieved Fromhttps://www.nation.co.ke/news/Big-hurdles-thwart-Jubilee-s-laptops-plan/1056-4676332-9w2jndz/index.html

Wasike, A. J. (2018). *Perceptions of teachers, learners and school principals on the integration of ICT in teaching and learning of secondary school agriculture in Bungoma County, Kenya.* Unpublished MSc Thesis. Egerton University.

Warschauer, M. & Matuchniak, T. (2010). New technology and digital worlds: Analyzing evidence of equity in access, use, and outcomes. *Review of research in education*, 34(1), 179-225.

Xu, Z., Yuan, H. and Liu, Q. (2021). Student performance prediction based on blended learning. *Journal of IEEE Trans education,* 64 (25), 66-73.

APPENDICES

Appendix i: Transmittal Letter to the Respondents

South Eastern Kenya University,
P.o Box 170- 90200,
Kitui.

The Head Teacher,
…… Primary School,
Dear Sir/Madam,

RE: RESEARCH VISIT TO YOUR SCHOOL

I am a graduate student at South Eastern Kenya University pursuing a Doctor of Philosophy in Curriculum Studies. I am conducting a study on **Integration of ICT in Teaching and Learning in Public Primary Schools in Kakamega County, Kenya,** as part of the course requirement. For this reason, your school has been sampled for the study. Therefore, the purpose of this letter is to kindly seek your participation in the study. Your identity will be upheld with the highest confidentiality, and the information will not be used for any other reason but that of this research. I will appreciate your co-operation and assistance.
Thank you.

Yours faithfully,
Mandila Ben Shikomera
CELL PHONE: 0726382880/0112431438

Appendix ii: Questionnaire for Teachers

This survey aims to gather data on how teachers in public primary schools in Kakamega County are integrating ICT into the teaching and learning process. By ticking (√) the boxes or, where appropriate, writing your answers in the spaces provided, you are asked to respond to the questions as honestly as you can. Please **DO NOT** indicate your name in this questionnaire or the name of your primary school. Your identity will be kept in sternest confidence, and the data you provide will only be used for this study's purposes.

Section A: Demographic Information

1. Indicate your gender. Male ( ) Female ( )

2. Indicate your age bracket.

21 – 30 years ( ) 31 – 40 years ( ) 41– 50 years ( )
above 50years ( )

3. What is your highest level of education?

M. Ed. ( ) B. Ed. ( )
Dip/Ed. ( ) Cert. ( )
Others ( ) Specify…….

4. What is your teaching experience as a primary school teacher?

Less than 5years ( ) 6 – 10years ( )
11 – 15years ( ) 16 – 20years ( )
above 20 years ( )

5. Indicate the category of the public primary school you are teaching in.

Boarding ( ) Day ( )

Section B: Teacher Training and Integration of ICT in Teaching and Learning in Primary Schools

6. Do you have the necessary training to use ICT in teaching and learning?

Yes ( ) No ( )

7. If yes, indicate the level of training.

M. Ed. ( ) Degree ( ) Diploma ( ) Certificate ( )

8. Do you use ICT in your classrooms to enhance learning and teaching?

Yes ( ) No ( )

9. Have you ever taken an ICT in-service training to help you incorporate the technology into your lessons?

Yes ( ) No ( )

10. Was the course appropriate for integrating ICT into both teaching and learning?

Yes ( ) No ( )

11. If yes, explain how the course was appropriate?

……

……

……

……..…….

12. Indicate the computer area you were trained in by ticking (√) the most appropriate box.

Areas teachers were trained in	
Computer software and in teaching	
Comp Skills	
Record and editing video teaching	
Use of web resources in teaching	
ICT Education Pedagogy	
Create smart boards lessons	
Integrate of ICT in teaching learning process	
More than 1 Area	
Locate, retrieve and retain content related information from arrange of text and technologies	

13. Please tick (√) the box that best reflects your opinion if you agree or disagree with the following statements regarding the influence of ICT training on teaching and learning in public primary schools in Kakamega County.

KEY

1. Agree
2. Neutral
3. Disagree

s/n	**Statement**	**1**	**2**	**3**
1	I have received training in integrating ICT into instruction.			
2	The training I attended included pedagogical aspects of incorporating ICT into teaching and learning.			
3	The training I received was sufficient for incorporating ICT into my teaching and learning.			
4	In addition to my regular training, I have received professional development for teachers in how to incorporate ICT into teaching and learning.			

Section C: Availability of digital devices and ICT Integration in Teaching and Learning in public primary schools

14. Does your school have digital devices for teachers' integration of ICT in teaching and learning processes? Yes ( ) No ( )

15. If yes, which ones?

……

……

……

…..…….....…..

16. Are the digital devices in your school adequate for integration of ICT in teaching and learning? Yes ( ) No ( )

17. Does your school lack some of the digital devices required to integrate ICT in teaching and learning? Yes ( ) No ( )

18. If yes, which digital devices are lacking in your school to integrate ICT into teaching and learning?

……

……

……

……

……

19. Are the digital devices available in your school appropriate for integration of ICT in teaching and learning? Yes ( ) No ( )

20. If No, Explain your answer.

……

……

…….....

.....…….....

21. Indicate by ticking (√) the most appropriate how the following digital devices are in teaching and learning in your school?

Digital device	**Often used**	**Sometimes**	**Seldom**	**Not used**
CDs				
DVDs				
Power point				
You tube				
Animation captions				
Images				
Smart boards				

22. To what extent do the following digital devices assist in realization of lessons objectives?

Computer facility	**Greater extent**		**Moderate extent**		**Less extent**	
	Frequency	%	Frequency	%	Frequency	%
CDs						
DVDs						
Smart boards						
Power points						
Captions						
Hyperlinks						
Computer						

Section D: Availability of Internet Connectivity and ICT integration in Teaching and Learning in Primary Schools

23. For the purpose of integrating ICT in the classroom, is your school connected to the internet? Yes ( ) No ( )

24. If yes, do you use it into your lessons for both teaching and learning?

Yes ( ) No ( )

25. How often does your school use the internet to facilitate learning and teaching?

Sometimes ( )

Often ( )

Seldom ( )

26. By which means does your primary school mainly have access to the Internet for teaching and learning?

Cable ( )

Fibre optic ( )

Wire local area network ( )

Satellite ( )

None ( )

27. How often do you use the internet for the following teaching and learning activities?

Internet activity	**Never**	**Several times**	**At least once a week**	**Every day**
Sending and reading e-mail				
Reading and watching news				
Searching online practical information				
Using online dictionary or encyclopedia				
Searching different sources on for information and learning about a particular topic you're interested in				
Taking part in online group discussion or forums				

Section F: Primary School Teachers Perceptions and ICT Integration in Teaching and Learning

28. Please tick (√) the box that best represents your opinion if you agree or disagree with the following statements regarding how ICT integration affects teaching and learning in elementary schools in Kakamega County.

KEY

1 Agree

2. Neutral

3. Disagree

s/n	Indicator	1	2	3
1	ICT integration improves teaching and learning across the curriculum in public primary schools.			
2	Use of ICT in teaching and learning improves the quality of education			
3	Teaching and learning and teaching can be made more pleasurable by using ICT tools.			
4	ICT integration can be stimulating for both teaching and learning.			
5	ICT integration in classrooms put more burdens on teachers' shoulders			
6	Using ICT tools in teaching and learning may be challenging.			
7	Students' critical thinking is improved through ICT integration in teaching and learning.			
8	The use of ICT in teaching and learning improves remedial instruction			
9	Knowing how to use ICT tools for teaching and learning is a worthwhile skill.			
10	The use of ICT in teaching and learning helps teachers prepare for their work.			

Appendix iii: Questionnaire for public primary school head teachers

This survey aims to gather data on how teachers in public primary schools in Kakamega County are integrating ICT into the teaching and learning process. By ticking (√) the boxes or, where appropriate, writing your answers in the spaces provided, you are asked to respond to the questions as honestly as you can. Please **DO NOT** fill out this questionnaire with your name or the name of your primary school. Your identity will be kept in sternest confidence, and the data you provide will only be used for this study's purposes.

Section A: Demographic Information

1. Indicate your gender.

   Male ( ) Female ( )

2. Indicate your age bracket

   21 – 30 years ( ) 31 – 40 years ( )

   41 – 50 years ( ) above 50years ( )

3. What is your highest level of education?

   M. Ed. ( ) B. Ed. ( )

   Dip/Ed. ( ) Cert. ( )

   Others ( ) Specify……..

4. What is your experience as a primary school head teacher?

   Less than 5years ( ) 6 – 10 years ( )

   11 – 15years ( ) 16 – 20 years ( )

   Above 20 years ( )

5. How long have you served as the head teacher of this institution?

   Less than 5 years ( ) 6 – 10 years ( )

   11 – 15 years ( ) 16 – 20 years ( )

   Above 20 years ( )

6. Indicate the type of primary school you are heading.

Boarding ( ) Day ( )

Section B: Teacher Training and ICT Integration in Teaching and Learning in Primary Schools

7. Are teachers in your school trained in ICT to integrate ICT in teaching and learning?

Yes ( ) No ( )

8. If yes, indicate the level of training.

M. Ed. ( ) Degree ( ) Diploma ( ) Certificate ( )

9. Do your teachers in your school integrate ICT in teaching and learning process?

Yes ( ) No ( )

10. Have teachers in your school ever attended any in service course in ICT to enable you integrate ICT in teaching and learning?

Yes ( ) No ( )

11. If yes, was the course relevant for integration of ICT in teaching and learning?

Yes ( ) No ( )

12. If yes, explain how the course was relevant.

……

……

……

……

13. Indicate the computer area your teachers were trained in

Computer package teachers received training	
Teaching with software for computers	
Teaching with videos	
Recording and editing instructional videos	
Using web resources while teaching	
Using of smart boards	
Create smart board lessons using ICT.	
Integrating ICT in teaching learning process	
Using buttons to keep students interested in class while locating, retrieving, and remembering content-related information from a variety of text and technology.	

Section C: Availability of digital devices and ICT Integration in Teaching and Learning in public primary schools

14. Does your school have digital devices for teachers to integrate ICT in teaching and learning in your school? Yes ( ) No ( )

15. If yes, which ones?

……

……

…….....

.....

16. Does your school have enough digital devices for teachers to integrate ICT in teaching and learning? Yes ( ) No ( )

17. If the answer is no, what digital devices is lacking in your school to integrate ICT in teaching and learning?

……

……

……

……

18. Are digital devices at your school suitable for using ICT in teaching and learning? Yes ( ) No ( )

19. If the answer is no, give an explanation.

……

……

……

……

20. If yes, how often do your teachers integrate the following digital devices in teaching and learning process?

Computer facility	**Often used**	**Sometimes**	**Seldom**	**Not used**
CDs				
DVDs				
Power point				
You tube				
Animation captions				
Images				
Smart boards				

21. To what extent do the following digital devices assist in realization of lesson objectives?

Digital device	**Greater extent**		**Moderate extent**		**Lesser extent**	
Computers	Frequency	%	Frequency	%	Frequency	%
CDs						
DVDs						
Smart boards						
Power points						
Captions						
Hyperlinks						

Section D: Availability of Internet Connectivity and ICT integration in Teaching and Learning in Primary Schools

22. For the purpose of integrating ICT in the classroom, is your school connected to the internet?

Yes ( ) No ( )

23. If the answer is yes, does your school use it in teaching and learning?

……

……

……

……

24. How often does your school access internet?

Sometimes ( )

Often ( )

Seldom ( )

25. By which means does your primary school mainly have access to the internet?

Cable ( )

Fibre optic ( )

Wire local area network ( )

Satellite ( )

26. How often do your teachers use internet for the following activities in teaching and learning?

Internet activity	**Never**	**Several times**	**At least once a week**	**Every day**
Sending and reading e-mail				
Reading and watching news				
Searching online practical information				
Using online dictionary or encyclopedia				
Searching different sources on for information and learning about a particular topic you're interested in				
Taking part in online group discussion or forums				

Section F: Primary School Teachers Perceptions and ICT Integration in Teaching and Learning

Please indicate whether you agree or disagree with the following characteristics concerning influence of integration ICT on teaching and learning in primary schools in Kakamega County by ticking in the box that represents your view appropriately.

KEY

1. Agree
2. Neutral
3. Disagree

s/n	Indicator	1	2	3
1	ICT integration improves teaching and learning across the curriculum in public primary schools.			
2	Use of ICT in teaching and learning improves the quality of education			
3	Teaching and learning and teaching can be made more pleasurable by using ICT tools.			
4	ICT integration can be stimulating for both teaching and learning.			
5	ICT integration in classrooms put more burdens on teachers' shoulders			
6	Using ICT tools in teaching and learning may be challenging.			
7	Students' critical thinking is improved through ICT integration in teaching and learning.			
8	The use of ICT in teaching and learning improves remedial instruction			
9	Knowing how to use ICT tools for teaching and learning is a worthwhile skill.			
10	The use of ICT in teaching and learning helps teachers prepare for their work.			

Appendix iv: Interview Schedule for the County Director of Education Officer

Demographic data

1. What is your highest education qualification?
2. How long have you worked as a County Director of Education officer?

Teacher Training levels and ICT Integration in Teaching and Learning in Primary Schools

3. Are your teachers in the county trained in ICT?
4. If yes, up to which level were they trained?
5 .Did the training of your teachers in ICT in the county involve pedagogical aspect?
6. Were your teachers trained in all computer packages?
7. After completing their pre-service training, have your teachers attended any professional development course in ICT in your county?
9. If yes, did the course improve their skills in integrating ICT in curriculum implementation?

Availability of computer facilities and ICT Integration in Teaching and Learning in public primary schools

10. On average, which computer facilities are available for ICT integration in teaching and learning in your county primary schools?
11. Are the computer facilities mentioned for ICT integration in teaching and learning adequate in your county as per the Ministry of Education requirements?
12. On average, which computer facilities for ICT integration in teaching and learning are lacking in your county as per Ministry of Education requirements?
13. If yes, which ones?
14. How do your teachers handle the shortage of the computer facilities that are lacking?
15. Are the computer facilities available for ICT integration in teaching and learning in your county's primary schools appropriate in accordance with the Ministry of Education policy?

Availability of Internet Connectivity and ICT integration in Teaching and Learning in Primary Schools

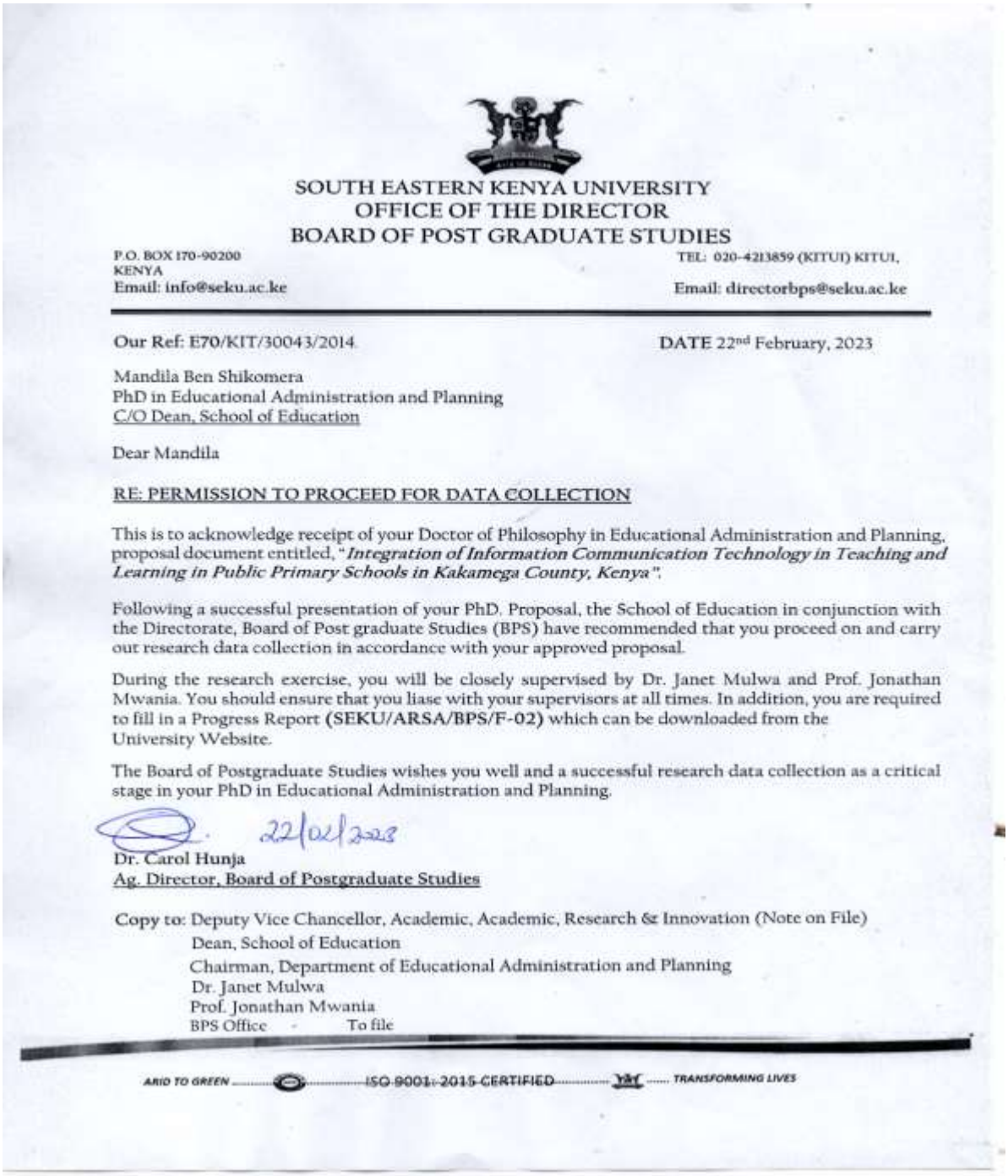
17. Are public primary schools generally connected to internet in your county?

18. If No, how do your primary schools download information from internet for teaching and learning process in your county?

Primary School Teachers Perceptions and ICT Integration in Teaching and Learning

19. What do primary school teachers in your county generally think about using ICT in the classroom?

Appendix v : Permission to collect data



SOUTH EASTERN KENYA UNIVERSITY
OFFICE OF THE DIRECTOR
BOARD OF POST GRADUATE STUDIES

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KENYA
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Email: directorbps@seku.ac.ke

Our Ref: E70/KIT/30043/2014 DATE 22nd February, 2023

Mandila Ben Shikomera
PhD in Educational Administration and Planning
C/O Dean, School of Education

Dear Mandila

RE: PERMISSION TO PROCEED FOR DATA COLLECTION

This is to acknowledge receipt of your Doctor of Philosophy in Educational Administration and Planning, proposal document entitled, "*Integration of Information Communication Technology in Teaching and Learning in Public Primary Schools in Kakamega County, Kenya*".

Following a successful presentation of your PhD. Proposal, the School of Education in conjunction with the Directorate, Board of Post graduate Studies (BPS) have recommended that you proceed on and carry out research data collection in accordance with your approved proposal.

During the research exercise, you will be closely supervised by Dr. Janet Mulwa and Prof. Jonathan Mwania. You should ensure that you liase with your supervisors at all times. In addition, you are required to fill in a Progress Report **(SEKU/ARSA/BPS/F-02)** which can be downloaded from the University Website.

The Board of Postgraduate Studies wishes you well and a successful research data collection as a critical stage in your PhD in Educational Administration and Planning.

22/02/2023

Dr. Carol Hunja
Ag. Director, Board of Postgraduate Studies

Copy to: Deputy Vice Chancellor, Academic, Academic, Research & Innovation (Note on File)
Dean, School of Education
Chairman, Department of Educational Administration and Planning
Dr. Janet Mulwa
Prof. Jonathan Mwania
BPS Office To file

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Appendix vi :Research Permit

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **183870**

Date of Issue: **02/March/2023**

RESEARCH LICENSE

This is to Certify that Mr., BEN SHIKOMERA MANDILA of South Eastern Kenya University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Kakamega on the topic: INTEGRATION OF INFORMATION COMMUNICATION TECHNOLOGY IN TEACHING AND LEARNING IN PUBLIC PRIMARY SCHOOLS IN KAKAMEGA COUNTY, KENYA for the period ending : 02/March/2024.

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