TEACHER PREPAREDNESS TO INTEGRATE TECHNOLOGY INTO TEACHING PUBLIC SECONDARY SCHOOLS IN TIGANIA WEST, MERU COUNTY, KENYA

NGAYA NANCY MUKIRI

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DECLARATION

I confirm that this thesis is my original work and has not been submitted for the award of a degree at any other university.

ED409/200821/19

Signature: ..... Date. .....

Ngaya Nancy Mukiri

This research thesis has been submitted with our approval as University Supervisors

Signature: ..... Date: .....

Prof. Hilda Nyougo Omae, Ph.D

Meru University of Science and Technology, Kenya

Signature: ..... Date: .....

Dr. Mercy Thuranira, Ph.D

Meru University of Science and Technology, Kenya

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DEDICATION

I dedicate this research thesis to my parents, Stanely Ngaya and Harriet Ngaya, for their unwavering encouragement and support throughout my studies.

OPERATIONAL DEFINITION OF TERMS

Teaching	Utilization of many technological tools, resources, and tactics to augment the process of learning
Technology	Use of digital tools, software, and devices to enhance teaching and learning in an educational setup
Integration of Technology	Use of digital tools to improve the quality of classroom learning during teaching
In-service training	Training provided to teachers while they are employed as teachers
Technological tools	Websites or online resources that can facilitate digital learning in schools
Digital	Devices, software, and online platforms used to enhance the learning journey for both students and educators
Digital learning	Application of digital technologies to deliver educational information and facilitate interactions between educators and learners in a digital setting(Vettriselvan, 2025)
Technology skills	The capability to locate, assess, utilize, share, and produce digital content using digital devices
Teacher Attitude	Teachers' perceptions of using technology in teaching
Teaching experience	The duration a teacher has been practicing teaching in secondary schools
Digital Literacy	The capability to use digital devices to access and explore information and content stored on them

Teacher preparedness	The extent to which educators possess the necessary knowledge, skills, and resources to plan, deliver, and assess instruction effectively
Knowledge-driven economy	Capability to harness scientific discoveries and practical research(Bayramova, 2024)

LIST OF ABBREVIATIONS

ICT	Information and Communication Technology
EFA	Education for All
SDGs	Sustainable Development Goals
UNESCO	United Nations Educational Scientific and Cultural
KICD	Kenya Institute of Curriculum Development
MOE	Ministry of Education
TAM	Technology Acceptance Model
NACTIE	National Center for Technology Integration in Education
SAGA	Semi-Autonomous Government Agency
NACOSTI	National Commission for Science, Technology and Innovation
CBC	Competency-Based Curriculum
TTC	Teacher Training College
HODS	Heads of Departments

ABSTRACT

Technology integration is essential in today's education landscape to equip students with digital-age skills. Although the Kenyan government has introduced several initiatives to enhance technology use in education, studies reveal that adoption in secondary schools remains limited. Research indicates that providing technological devices alone is insufficient unless the teacher's role is adequately addressed. This study examined teachers' preparedness to integrate technology into instructional delivery in public secondary schools in Tigania West Sub-County. The objectives were: to investigate how the availability of technological tools influences their integration in teaching; to examine teachers' attitudes towards technology and its impact on teaching; and to explore the influence of in-service training on technology integration. A descriptive survey design was adopted, guided by Davis's (1986) Technology Acceptance Model (TAM). The target population included 50 public secondary schools, with 50 principals, 100 heads of departments, and 200 teachers. Stratified random sampling was used to select schools, while purposive sampling identified the study respondents. The sample consisted of 105 participants 15 principals, 30 heads of departments, and 60 teachers representing 30% of the population. Data collection tools included questionnaires, interviews, and observation checklists. Reliability was tested using the test-retest method and Pearson's product-moment correlation. Quantitative data were analyzed using means, frequencies, and percentages, while qualitative data were analyzed through content analysis. Findings showed that the availability of technological tools, teacher attitudes, and training significantly influenced technology integration. While teachers were generally optimistic about using technology, most lacked the skills to apply it effectively. Although many had basic ICT training, they struggled to incorporate it meaningfully into teaching. The study recommended enhancing teacher training curricula with more robust technology content, addressing teacher attitudes, and offering continuous professional development especially for experienced teachers. Schools should also guide ICT deployment and promote self-initiated efforts. Further research was suggested to evaluate the cost-effectiveness of technology integration in education.

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CHAPTER ONE: INTRODUCTION

This chapter entails the background of information, statement of problem, purpose of the study, study objectives, research questions, justification of the study, significance of the study, limitations of the study, delimitation of the study, and assumptions of the study.

1.1 Background of the Study

Technology represents the practical application of scientific knowledge to solve real-world problems, enhance processes, and achieve specific objectives (Taranto *et al.,* 2024).It encompasses various tools, systems, and methods designed to meet human needs and desires, from simple devices to complex systems. In education, technology plays a pivotal role in transforming traditional learning environments and enhancing educational experiences.

In educational settings, technology includes various tools and resources that support teaching, learning, and administrative functions. These tools range from hardware such as computers, tablets, interactive whiteboards, and projectors to software applications, educational websites, and digital learning platforms (Kabariah & Adiyono, 2023). Each component serves a unique purpose, contributing to a more dynamic and interactive learning experience.

The integration of technology into education is not limited to the mere presence of these tools but involves embedding them into instructional practices to improve teaching effectiveness and student outcomes (Haleem *et al.,* 2022). For instance, interactive whiteboards and projectors can facilitate more engaging presentations and interactive lessons. At the same time, educational software and apps offer personalized learning experiences that can cater to different learning styles and paces.

Moreover, technology in education can significantly transform traditional learning environments by expanding access to a wide range of digital resources. This transformation allows for anytime, anywhere learning, where students can access educational materials and engage in learning activities beyond the confines of a physical classroom. Digital platforms provide opportunities for remote learning and online courses, enabling students to continue studying from any location with internet access (Mahdi, 2023).

Additionally, technology fosters enhanced collaboration and communication among students and educators. Tools such as online discussion forums, collaborative project platforms, and virtual classrooms facilitate interaction and teamwork across geographical boundaries. These digital environments enable students to work together on projects, share ideas, and receive feedback in real-time, thereby enriching the learning process and promoting a more connected educational community.

Teacher preparedness for incorporating technology into teaching involves a varied set of competencies that educators must possess to integrate digital tools into their classrooms effectively. This includes having a solid foundation of knowledge about various technologies, such as educational software, online platforms, and digital devices, as well as the skills to use these tools to enhance instructional methods (Akram *et al.,* 2022).Beyond technical proficiency, teacher preparedness also encompasses the right attitudes towards technology, including a willingness to adopt new tools, an openness to change traditional teaching methods, and a positive mindset about the potential of technology to improve student learning.

Additionally, access to adequate resources is crucial, as teachers need reliable internet, up-to-date devices, and ongoing professional development opportunities to stay current with

technological advancements (Coman *et al.,* 2020). Adequate preparation also involves troubleshooting common technical issues and adapting lessons to incorporate technology that aligns with educational goals. In essence, teacher preparedness is about equipping educators with the comprehensive capabilities needed to smoothly integrate technology into their teaching practices, thereby fostering an enriched and dynamic learning environment for students (DeCoito & Richardson, 2018).

Teachers should have a basic level of technical proficiency to operate and troubleshoot technology tools and devices (Coman *et al.,* 2020). Additionally, they need an understanding of education and expertise in how to incorporate technology in ways that align with educational goals, instructional objectives, and student learning needs (DeCoito & Richardson, 2018). This involves selecting appropriate technological tools and resources, designing engaging and interactive learning activities, and facilitating meaningful learning experiences for students.

Globally the push for incorporating technology into educational curricula is closely linked to the pursuit of Sustainable Development Goals (SDGs), particularly SDG 4, which aims to ensure inclusive and equitable quality education for all (Shava *et al.,* 2023). Additionally, it supports the goals of Education for All (EFA), which emphasize broadening educational access and improving learning outcomes (Roy, 2019).

UNESCO underscores that integrating technology in education is a critical strategy for governments worldwide as they strive to provide quality education that contributes to the overall well-being of their citizens (Solmaz, 2023). Technology is increasingly seen as a powerful tool to democratize education by breaking down barriers to access, such as

geographical constraints and resource limitations, and enabling more students to participate in the learning process (Sung, 2023).

Moreover, technology enhances the learning experience by making it more interactive, engaging, and enjoyable, which can lead to better retention and understanding of material. It also allows for more efficient use of class time, as digital tools can streamline administrative tasks and provide opportunities for personalized learning, where students can progress at their own pace. This aligns with global educational initiatives aimed at improving the quality and effectiveness of teaching and learning, ensuring that students are better prepared for the demands of the 21st century (Sung, 2023).

The rapid pace of technological advancement in the 20th century has ushered in a knowledge-driven economy, fundamentally transforming various sectors, including education (Shan & Wang, 2024).Governments worldwide have made substantial investments in educational technology, recognizing the critical role that technology plays in equipping individuals with the skills necessary for success in the modern world. This strategic investment aims to enhance learners' abilities to navigate and thrive in a technology-centric environment.

In the United Kingdom, the government has committed significant financial resources to integrate technology into education. For instance, the UK allocated £2.5 billion towards educational technology (Gurick, 2024). This investment reflects a concerted effort to modernize educational tools and resources, ensuring that students have access to cutting-edge technology that supports and enriches their learning experiences. The funding is used to upgrade digital infrastructure, provide teachers with professional development in technology integration, and equip classrooms with advanced technological tools.

Similarly, the United States has demonstrated a strong commitment to investing in educational technology. In 2008, the expenditure on technology for K-12 schools and higher education institutions amounted to $6 billion(Fu *et al.,* 2024).Although this figure decreased to $4.7 billion in 2009, it underscores the substantial financial resources available to enhance educational technology across various educational levels. These investments aim to improve educational outcomes, foster digital literacy, and prepare students for the demands of the 21st century.

In New Zealand, the government allocates over $410 million annually to support school technology infrastructure (Dhawan *et al.,* 2024). This funding is crucial for maintaining and upgrading technological resources in schools, ensuring students and educators access reliable and current technology. The investment supports the development of digital learning environments, facilitates technology integration into the curriculum, and provides necessary infrastructure to support effective technology use in classrooms.

These examples of substantial government investment in educational technology across different countries highlight the global recognition of technology's importance in education. By funding the development and implementation of technological tools and infrastructure, governments aim to enhance educational experiences, improve learning outcomes, and prepare students for a future where technological proficiency is essential (Alharbi, 2023). Such investments reflect a broader commitment to adapting education systems to meet the evolving needs of students in an increasingly digital world.

Despite substantial investments in technology equipment, infrastructure, training, and development aimed at improving education in various countries, the expected widespread adoption of technology in teaching, particularly in African nations, has not yet been fully

realized Hiran and Henten, (2020). This discrepancy highlights a significant gap between the resources allocated to technological advancements and their actual implementation within educational practices. Although the education sector has made notable strides in integrating technology, the rate at which educators are effectively adopting these tools remains insufficient. This is especially evident in many African countries, where systemic challenges such as inadequate digital literacy, lack of continuous professional development, and insufficient support structures hinder the successful integration of technology into everyday teaching.

Additionally, while investments have created a foundation for technological integration, the absence of consistent and meaningful adoption indicates a need for more targeted strategies that address the specific barriers preventing educators from fully utilizing these tools (Arredondo-Trapero *et al.*, 2020). Thus, the focus must shift towards not only investing in technology but also ensuring that educators are adequately prepared, supported, and encouraged to integrate these resources into their teaching practices effectively (Arredondo-Trapero *et al.,* 2020).

In South Africa, the Gauteng Province Minister of Education announced plans to implement a new instructional approach where educators and learners will use tablets, signaling a significant shift towards digital learning environments (Rasoo & Naidoo, 2024). This initiative suggests that traditional tools such as chalkboards, written class notes, and textbooks may soon become obsolete, reflecting a broader trend towards integrating technology in education (Trelease, 2016). Such changes are not unique to South Africa a transnational comparative study of technology integration in teaching across 28 states highlighted that countries like the Netherlands, Finland, Norway, and Singapore have

already enacted educational reforms aligned with global technological advancements (Arrosagaray *et al.*, 2019). These reforms focus on incorporating digital tools into the classroom and reshaping what students learn, emphasizing the development of technology-related skills and interpersonal competencies critical for the 21st century. The study underscores that these countries have prioritized technology training and the cultivation of soft skills, recognizing their importance in preparing students for a rapidly evolving global landscape. This shift reflects a growing recognition that modern education systems must adapt to technological changes to provide students with the skills necessary for success in an increasingly digital world (Arrosagaray *et al.*, 2019).

In Kenya, the government's commitment to enhancing technology integration in education is evident through allocating more resources to equip schools with technological tools, reflecting the country's broader Vision 2030 initiative (Muasa, 2019). A vital aspect of this initiative is the computer provision program aimed at colleges, public universities, and secondary schools. This was designed to improve access to technology and support digital learning environments (Bati & Workneh, 2021). For instance, research indicates that in the financial years 2009, 2010/12, and 2012/13, 145,200 computers were distributed to 400 schools, demonstrating a significant investment in building the technological infrastructure necessary for modern education (Kumar *et al.,* 2020).

The national technology strategy underscores the potential of technology to enhance the quality, equity, and relevance of education across all levels. KICD has spearheaded efforts to digitize the curriculum and promote e-learning, aiming to facilitate online learning in public schools and provide a structured approach to implementing digital education (Woomer *et al.,* 2021). This strategy involves incorporating digital tools such as projectors,

smart boards, and computers into classrooms. It emphasizes the need to digitize curricula across all educational institutions, from primary schools to vocational and technical training centers. Moreover, the strategy includes disseminating digital content through various channels, including the internet, radio, TV, flash disks, and mobile devices, ensuring that learning is accessible and adaptable to diverse educational needs nationwide.

The Kenyan Constitution of 2010 advocates for the development of a computer-integrated construction technology information environment across counties. This aims to create a cohesive and technologically advanced framework for integrating technology into various sectors, including education (Sholanke *et al.,* 2023). This recommendation highlights the necessity of revising existing technological structures to support and enhance technology integration in learning institutions, thus preparing students for a rapidly evolving digital world.

The transition from the 8.4.4 education system to the Competency-Based Curriculum reflects a significant shift in Kenya's educational approach. The CBC is designed to equip students with essential 21st-century skills, including digital literacy, problem-solving abilities, collaboration, and critical thinking (Muchira *et al.* 2023). This curriculum emphasizes not just academic knowledge but also the development of practical skills that are crucial in today's technology-driven society. The CBC aims to prepare students to navigate and succeed in an increasingly complex and interconnected world by focusing on these competencies.

A key component of this educational reform is the integration of digital technologies and into the learning process. The presidential reform on education underscores the importance of embracing technological advancements to enhance educational outcomes (Burns, 2023).

This integration is not merely about introducing new tools but involves a comprehensive approach to embedding technology into the educational framework.

Incorporating technology into education offers several benefits. Firstly, it provides students and teachers with access to a wealth of educational resources to enhance the learning experience. These include online textbooks, interactive simulations, and educational videos that can supplement traditional teaching materials.

Secondly, technology facilitates personalized learning by enabling adaptive learning platforms that cater to individual student needs and learning styles. This personalization helps to address diverse learning paces and preferences, making education more effective and inclusive.

Thirdly, promoting digital literacy skills is crucial in preparing students for future careers and daily life in a digital world. Technology integration ensures that students are consumers of digital content and proficient in creating and managing it.

Finally, technology fosters communication and collaboration among students and educators. Tools like online discussion forums, collaborative projects, and virtual classrooms enable more interactive and dynamic learning environments, enhancing student engagement and teamwork.

Despite the Kenyan government's substantial investments in promoting technology integration in public schools, reports indicate that the process is progressing slowly in many counties, including Meru County (Akai Nettey *et al.,*2024). The slow pace of technology adoption is partly due to insufficient technological infrastructure, such as laptops, computers, smart boards, routers, and projectors, which remains inadequate to drive the necessary educational changes. Researchers argue that even with the provision of these tools, the

integration of technology in schools will likely falter unless the government addresses the critical "teacher factor," which plays a pivotal role in the successful incorporation of technology into the educational system (Suyitno *et al.*, 2024).

Teachers are essential to this process, as they are the primary facilitators of technology-based instructional delivery (Çömlekçi 2022). However, recent findings suggest that the technological initiatives implemented by the Kenyan government did not adequately account for teachers' readiness to adopt and utilize these tools effectively in their teaching practices, leading to significant challenges in merging traditional and digital teaching methods (Çömlekçi 2022).This lack of focus on teacher preparedness resulted in a substantial barrier to the successful integration of technology in public secondary schools. Consequently, this study aims to assess the level of preparedness among teachers in public secondary schools to integrate technology into their instructional delivery, recognizing that teacher readiness is a critical factor in the effective use of technology in education (Suyitno *et al.,* 2024b).

1.2 Statement of the Problem

In today's education landscape, it is crucial to effectively integrate technology in education to enhance student educational outcomes and equip them for the digital era. However, the effectiveness of technology integration depends on various factors, like teacher preparedness, attitudes toward technology, access to training, and the availability of ICT infrastructure. In Tigania West, there is little information about public secondary school teachers' preparedness in these areas and how it affects the use of technology in instruction delivery. If teacher readiness in technology integration is not adequately addressed, it may reduce student engagement and resistance to future technological innovations. Neglecting teachers' preparedness in technology integration can significantly impact teaching effectiveness,

teacher well-being, and the overall educational experience for students. In light of this, this study examines teacher preparedness in incorporating technology in public secondary schools in Tigania West sub-county, Meru County.

1.3 Purpose of the Study

This study evaluated teacher preparedness in integrating technology in public secondary schools, including attitudes, availability of technological tools, and in-service training.

1.4 Study Objectives

1.4.1 Specific objectives

To examine the level of teacher preparedness for integrating technology into teaching in public secondary schools in Tigania West, Meru County.

1.4.2 Specific objectives

i. To investigate how the availability of technological tools influences their integration in teaching at public secondary schools in Tigania West.
ii. To examine the teachers' attitudes towards technology and its impact in teaching at public secondary schools in Tigania West.
iii. To explore the influence of teachers' in-service training on technology integration in public secondary schools in Tigania West.

1.5 Research Questions

i. How does the availability of technological tools influence their integration in teaching at public secondary schools in Tigania West?
ii. How do teachers' attitudes towards technology affect its integration in teaching at public secondary schools in Tigania West?

iii. To what extent does teachers' in-service training influence technology integration in teaching at public secondary schools in Tigania West?

1.6 Justification of the Study

Teacher preparedness to integrate technology in a secondary school is crucial for several reasons. First, it enhances instructional effectiveness by ensuring educators are proficient in using technology tools, thereby facilitating more engaging and interactive lessons. In addition, prepared teachers are better equipped to adapt to rapidly evolving technological advancements, equipping learners with current knowledge and skills. Furthermore, teacher readiness fosters a positive learning environment, as confident instructors can effectively manage and troubleshoot technological issues, minimizing disruptions.

Secondly, teacher preparedness for technology integration aligns with the national goals of Kenyan education in several ways: Enhances learning experiences for students by helping them acquire 21st-century skills like digital literacy and problem-solving, which are essential for Kenya's developmental goals; Equipping teachers to incorporate technology effectively into the education system, fostering student innovation and creativity. This aligns with the Kenyan vision of becoming a technological innovation and entrepreneurship hub; and helping in overcoming geographical barriers and resource constraints thus, enabling access to quality education in remote areas.

1.7 Significance of the Study

First, the findings from this study will offer valuable insights into the current state of technology adoption in secondary schools. The study has highlighted areas where additional support or resources may be needed by evaluating teachers' readiness to use technological tools. This information is instrumental in the MOE's decision-making about where to

allocate resources and how to tailor policies better to support technology integration in education.

Secondly, the recommendations derived from this study will guide the MOE in shaping future educational strategies and initiatives. For example, if the survey identifies gaps in teachers' training or infrastructure, the MOE can develop targeted programs to address these issues. This might include revising teacher training curricula to include more comprehensive technology-related content or investing in upgrading ICT infrastructure in schools. This study is also essential to the MOE as it have comprehensively assessed secondary school teachers' readiness to integrate technology into their teaching practices. Understanding teachers' preparedness and the effectiveness of current technology integration efforts.

Stakeholders such as the KICD will also benefit from this study. The KICD can utilize the data to inform the development and refinement of teacher training and professional development policies. By understanding teachers' current challenges and needs, the KICD can design more effective training programs that focus on enhancing digital literacy, pedagogical skills related to technology use, and overall confidence in integrating technology into instruction.

The study provides a framework for school administrators to assess their teachers' capabilities in incorporating technology into the classroom. School management can identify strengths and weaknesses in their current technology integration efforts by examining the availability of ICT infrastructure, the quality of teachers' training, and their attitudes towards technology. This assessment enables administrators to develop and implement more effective strategies for supporting technology use among teachers.

The study's information helps school management craft strategies to enhance technology integration by providing targeted support to teachers. This might involve facilitating access to in-service training on technology usage, offering professional development opportunities, and creating a supportive environment that encourages teachers to embrace new technological tools and methods. Additionally, by improving digital literacy and skills among teachers, schools can foster a more positive perception of technology as a valuable instructional approach.

This study benefits secondary school teachers as it helps them recognize their crucial role in integrating technology into their teaching practices. The insights gained illuminates how the availability of technology infrastructure, teachers' attitudes, and their training impact technology integration. By embracing the findings and recommendations of the study, teachers contribute to a more effective and modernized educational environment that leverages technology to enhance teaching and learning processes. This proactive approach to technology integration aims to improve educational outcomes and prepare students for the demands of a digital world.

1.8 Limitations and Delimitation of the Study

1.8.1 Limitation of the study

The study encountered several limitations:

Some teachers had tight teaching schedules, which delayed their responses to research questions. To address this issue, the researcher and teachers agreed on a convenient day for responses.

Poor road conditions impeded the researcher's access to respondents in schools located in remote areas. To mitigate this challenge, the researcher enlisted the help of a research

assistant familiar with the schools in the Sub-County. The assistant administered questionnaires and conducted interviews with the respondents in some schools, ensuring that the data was collected within the specified time-frame.

1.8.2 Delimitations of the study

The study focused on examining teacher preparedness in using technological tools like laptops interactive whiteboards, computers, and projectors. The study only considered the specific variables identified for investigation and did not explore other factors that could affect teacher preparedness in integrating technology in public secondary schools. The study was conducted in only one out of nine sub-counties due to financial limitations and time constraints. This delimitation allowed the study to be conducted within a manageable time frame and budget.

1.9 Assumptions of the Study

The study presumed that all respondents would honestly respond to the instruments.

It also assumed that all secondary school teachers in the sub-county have access to technological devices and infrastructure.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter explores the existing literature on teachers' readiness to incorporate technology into their instructional practices. It reviews essential findings by citing relevant studies, publications, journals, and insights from credible sources and experts. These sources are local, contemporary, regional, international, or current.

2.2 Theoretical Framework

In education, scholars have developed various theoretical frameworks for incorporating technology into secondary school teaching. These frameworks have been utilized in studies focusing on technology integration in education. For instance, the Technology Acceptance Model has been used to examine different facets of technology use and the importance of digital competence.

2.2.1 Technology acceptance model

The Technology Acceptance Model, introduced by Fred Davis in 1986, provides a theoretical framework for understanding how individuals accept and use information systems. The Technology acceptance model (TAM) states that a user's acceptance and actual use of a new technology is primarily determined by three key tenets which are perceived usefulness, perceived ease of use and attitude towards use. According to TAM, the acceptance of a new technology is primarily determined by two key factors: perceived usefulness and perceived ease of use. Perceived usefulness refers to the degree to which an individual believes that using the technology will enhance their job performance, while perceived ease of use pertains to the degree to which the technology is perceived as free from effort.

TAM suggests that an individual's behavioral intention to use technology is influenced by their attitude towards it, which in turn is shaped by their perceptions of usefulness and ease of use. The model posits that if users perceive a system as beneficial and easy to use, they are more likely to adopt it. This means that the more users believe that technology will improve their performance and that it is simple to use, the higher their likelihood of integrating it into their practices.

However, TAM also acknowledges that an individual's attitude is not the sole determinant of technology use. The model incorporates the technology's impact on the user's performance. Even if initial resistance exists, individuals are more likely to adopt the technology if they perceive it as beneficial to their work. This aspect of TAM highlights the interplay between an individual's perception of a system's utility and willingness to embrace it.

In education, the TAM framework is particularly relevant for understanding how teachers interact with technology. Research has shown that teachers are more likely to integrate technology into their teaching practices when they find it user-friendly and believe it meets their needs or those of their students. When educators perceive technology as both easy to use and advantageous for enhancing educational outcomes, they are more inclined to incorporate it into their instructional strategies.

According to studies applying TAM, teachers' readiness to incorporate technology into their teaching processes is significantly influenced by their attitudes toward technology. Teachers who have positive attitudes toward the use of technology and believe that it can lead to improved learning experiences are more likely to adopt and use it effectively. When teachers view technology as a valuable tool that can enhance the quality of education and is simple to integrate into their teaching, their willingness to use it increases.

2.3 Empirical Literature

2.3.1 The role of technology in education

Technology integration in education is multifaceted, offering numerous benefits that enhance teaching and learning experiences. One of the primary purposes of incorporating technology is to prepare students for an increasingly digital future (Kouser & Majid, 2021). As digital literacy becomes a critical skill in the workforce, schools are tasked with equipping students with the necessary technological skills, critical thinking, and ethical considerations regarding the use of technology (Min and Fink, 2021).Additionally, technology plays a significant role in increasing student engagement and motivation. Interactive tools such as educational apps, virtual reality, and gamified learning make lessons more dynamic and engaging, allowing students to interact with content in previously impossible ways. This engagement makes learning experiences more enjoyable and effective (Szymkowiak *et al.,* 2021).

Moreover, technology supports personalized learning by tailoring educational content to meet individual students' needs. Adaptive learning platforms, for instance, adjust the complexity of tasks based on a student's performance, ensuring that each learner is appropriately challenged. This personalization is vital for catering to various learning styles and improving learning outcomes (Swanson & Bianchini, 2015). Furthermore, technology facilitates collaboration and peer learning, enabling students to collaborate on projects, share knowledge, and provide real-time feedback, even when not in the exact physical location. This capability fosters a more inclusive and interactive learning environment (Kouser & Majid, 2021).

For teachers, technology offers valuable support by providing new methods of instruction and enabling collaboration between novice and experienced educators. Newly graduated teachers, often more familiar with the latest technological tools, can assist their veteran colleagues in integrating these tools into their teaching practices, thus improving the overall quality of education (Swanson & Bianchini, 2015). Technology has also significantly increased access to global information, allowing students to explore a wide range of resources beyond the traditional classroom, fostering independent learning and critical thinking (Kouser & Majid, 2021). Lastly, as society undergoes cultural changes, technology helps education systems adapt by bridging cultural gaps and providing inclusive, accessible resources that cater to diverse student populations(Min and Fink, 2021). This adaptability ensures that education remains relevant and effective in a rapidly changing world.

Teachers today employ various technological tools to enhance the teaching and learning process, making education more interactive and efficient. These tools are integral to creating assessments, assigning tasks, and providing instant feedback, all of which contribute to a more personalized and engaging learning experience for students. The importance of integrating technology into education is recognized globally, with significant steps being taken to establish frameworks and institutions that support this integration. For instance, in Kenya, the task group responsible for aligning the education sector with the 2010 constitution recommended the enhancement of institutional frameworks to incorporate technology across all educational levels. This includes the proposal to establish the National Centre for the Advancement of Technology in Education (NACTIE) at the county level, focusing on advancing technological integration in education throughout the country (Mora *et al.,* 2020).

Moreover, the success of any technology program within an educational institution heavily relies on effective professional development for teachers. Comprehensive training in technology is essential, as it equips educators with the necessary skills to effectively use these tools in their teaching practices. Without proper training, the potential benefits of technology in education may not be fully realized. Professional development programs should, therefore, be a vital component of any strategy aimed at integrating technology into education, ensuring that teachers are comfortable using these tools and proficient in leveraging them to enhance student learning outcomes (Hu *et al.,* 2021).

The successful integration of technology in education depends on several critical factors, including resources and adequate teacher professional development. Without comprehensive training, teachers often lack the confidence and proficiency to incorporate technology into their teaching practices effectively. This deficiency can lead to the under-utilization of available technological tools, ultimately limiting the potential benefits of technology in enhancing educational outcome settings (Pasique & Maguate, 2023)

Teachers can only impart the knowledge and skills acquired through their training. Therefore, rigorous and ongoing professional development is essential to ensure educators can effectively use ICT in the classroom. Training programs should be designed to build teachers' technical skills and pedagogical understanding of integrating technology to enrich learning experiences. This ongoing professional development is crucial for keeping educators up to date with the latest technological advancements and teaching methodologies (Momdjian *et al.,* 2024).

Moreover, successfully adopting ICT in education is not just about training; it also requires easy access to ICT resources. These resources include computers, laptops, smart-boards,

projectors, and updated software and hardware. Without these essential tools, teachers are unable to implement ICT strategies effectively. Access to reliable ICT resources ensures that teachers can fully utilize their training, thereby fostering an environment where technology can enhance the learning process (Vatanartıran & Karadeniz, 2015).Therefore, adequate professional development and access to ICT resources are critical to successfully integrating technology into education.

2.3.2 Availability of ICT infrastructure

Integrating technology into education requires schools to have adequate access to ICT infrastructure and digital resources. These include hardware such as computers, laptops, projectors, smartboards, printers, scanners, and storage devices, as well as essential software, educational applications, and most critically, reliable internet connectivity. Access to such infrastructure is a fundamental prerequisite for the successful implementation of Information and Communication Technology (ICT) in teaching and learning processes (UNESCO, 2022). While the availability of ICT infrastructure sets the foundation, research continues to demonstrate that infrastructure alone does not guarantee its effective integration in classrooms. For instance, Mwangi & Njiru (2022), in their study on ICT integration in Kenyan public secondary schools, found that despite the presence of ICT tools in some schools, many teachers still relied on traditional methods due to limited training and low digital literacy. The underutilization was attributed not only to lack of skills but also to irregular maintenance, power interruptions, and lack of technical support.

Similarly, Adu-Gyamfi & Brenya (2023) found that in Ghana, even though most urban secondary schools were equipped with computers and internet, ICT tools were mostly used for administrative work rather than instructional purposes. This supports the notion that

infrastructure alone cannot drive pedagogical transformation without a simultaneous investment in teacher training and support systems.

Moreover, Mulenga (2022) argues that a well-developed ICT infrastructure must also include routine maintenance and upgrades. Without proper upkeep, technology becomes obsolete or unusable, which hampers any progress toward digital integration in teaching. The study recommends that policymakers ensure not only the initial provision of technology but also sustainable support mechanisms.

A report by Education International (2023) emphasizes that equitable access to ICT infrastructure remains a significant challenge, particularly in rural and marginalized regions of Sub-Saharan Africa. The digital divide is still prevalent, with urban schools enjoying better infrastructure compared to their rural counterparts. This discrepancy perpetuates educational inequality and hampers efforts to achieve inclusive and quality education for all, as envisioned by Sustainable Development Goal 4.

In addition, Karanja *et al.* (2022) highlight that institutional factors such as availability of ICT policies, school leadership support, and ICT budgets significantly influence the use of infrastructure. Schools that have structured ICT policies and dedicated funding are more likely to effectively utilize available tools than those without.

The presence of ICT infrastructure is crucial for technology integration in schools, it must be accompanied by other enablers such as teacher capacity building, ongoing technical support, policy frameworks, and equitable resource distribution. The effective integration of technology is a multi-dimensional process that extends beyond mere physical access to devices.

Teachers play a critical role in the successful integration of ICT into education. According to Alkahtani (2017), even when ICT resources are available, teachers may still face challenges in incorporating technology into their classrooms without adequate access to appropriate software and ongoing support. This limitation can stem from various factors, including a lack of training, confidence, or familiarity with the available technology. Therefore, providing the necessary infrastructure and ensuring that teachers have the skills and knowledge to utilize these resources effectively is essential.

Furthermore, (Warioba *et al.,* 2022b) while access to ICT infrastructure is an essential initial step, it does not guarantee that ICT will be integrated into teaching and learning processes. Effective integration requires a holistic approach that includes professional development, curriculum alignment, and ongoing support for educators. Schools must also cultivate a culture that encourages using ICT to enhance learning rather than just an add-on to traditional teaching methods. This comprehensive approach ensures that the investment in ICT infrastructure leads to meaningful improvements in educational outcomes.

The effective integration of ICT into teaching and learning depends on the availability and accessibility of ICT resources, such as computer hardware and software. Without these essential tools, teachers face significant challenges in utilizing ICT to enhance their instructional methods. Warioba *et al., (*2022) emphasize that the successful incorporation of technology into education relies heavily on the presence and ease of access to these resources. This access is crucial because even well-trained teachers cannot effectively integrate ICT into their teaching without the necessary tools and infrastructure.

In addition, Tallvid (2016) highlights that the absence of adequate ICT resources, such as computers and updated software, hinders teachers' ability to use technology effectively in

the classroom. This limitation underscores the importance of ensuring that schools are equipped with modern technology and that teachers have reliable access to these resources.

A study by Abbas *et al.* (2023) further supports this view, revealing that the availability of technical resources significantly improves instructors' ability to utilize ICT in their teaching practices. This study shows a direct correlation between resource availability and the effective use of technology in education. Similarly, a survey conducted on 814 faculty members in higher education in Turkey found that most faculty members had access to computers and the internet. Therefore, underscoring the importance of this access in promoting the integration of ICT in higher education (Ofosu-Asare, 2024).

Additionally, instructors need computer and network access both at school and at home. Insufficient access can impede the incorporation of ICT into teacher training, thereby limiting the overall effectiveness of technology integration in education (Ofosu-Asare, 2024). Esteve-Mon *et al.* (2023) further highlight that access to the appropriate hardware and software, along with the use of suitable tools and programs, is essential for assisting teaching and learning. This access ensures that teachers can fully leverage ICT to enhance the educational experience, making technology a powerful tool for instruction and learning.

2.3.3 Teachers' attitudes towards use of technology in teaching

The successful integration of technology in education is not solely dependent on the availability of devices and infrastructure; rather, it is equally if not more contingent upon teachers' perceptions, attitudes, and beliefs regarding the use of technology in the classroom. Research consistently shows that teachers play a central role in determining whether and how technology is adopted in schools. Their attitudes influence not only the frequency of

use but also the manner and purpose for which technology is employed in instruction (Yary, 2024).

When teachers hold positive perceptions about technology seeing it as a tool to enhance student engagement, promote personalized learning, and improve instructional efficiency they are more likely to integrate it into their teaching practices (Ng'ang'a & Wambugu, 2023). These attitudes are shaped by various factors, including previous experiences with technology, perceived ease of use, perceived usefulness, access to technical support, and the level of professional development received (Alenezi, 2022).

Conversely, negative attitudes stemming from fear of change, lack of confidence, inadequate training, or past difficulties can serve as significant barriers to the adoption of ICT, even when infrastructure is available (Mutuku & Otieno, 2022). Teachers who feel overwhelmed by technology or who doubt its pedagogical value are less inclined to use it, thereby limiting students' exposure to digital learning environments.

In a study by Kebede and Lemma (2023), it was found that teachers' beliefs about the relevance of technology to their subject matter strongly influenced their willingness to integrate it. Those who believed that ICT added value to their subject content demonstrated more frequent and creative use of digital tools in lesson delivery.

Furthermore, UNESCO (2022) emphasized that changing teacher attitudes toward technology requires sustained professional development, ongoing mentorship, and institutional support. One-off training sessions are often insufficient to shift entrenched beliefs. Instead, continuous, hands-on, and context-relevant training accompanied by supportive leadership and collaboration among peers is more effective in building confidence and fostering positive attitudes.

Therefore, while hardware and connectivity lay the groundwork for ICT use in education, it is the human factors especially teachers' mindsets and willingness that ultimately determine its success. Promoting positive teacher attitudes must be a strategic priority in any educational technology initiative.

To achieve the intended outcomes of government investments in educational technology, it is crucial to address not only the physical provision of devices but also the underlying attitudes and beliefs of teachers. Professional development programs that focus on changing perceptions and building confidence in using technology are essential. These programs should be designed to help teachers see the value of technology in education and provide them with the skills and knowledge necessary to integrate it effectively into their teaching practices (Elsa Yary, 2024).

Studies have observed that younger teachers generally exhibit more favorable views toward technology. This trend is likely due to their exposure to technology training during their teacher education, which equips them with the necessary skills and familiarity with digital tools. However, it is essential to consider the impact of teachers' ages and years of service when evaluating their use of technology in schools. Older teachers or those with more years of service may have different attitudes toward technology, potentially due to a lack of exposure or training in their earlier professional development. Therefore, tailored training programs that address the specific needs and concerns of different age groups and experience levels are necessary to ensure that all teachers can effectively utilize technology in their teaching (Khukalenko *et al.,* 2022).

According to Ngodu *et al.* (2024), instructors play a crucial role in the successful integration of Information and Communication Technology (ICT) in educational settings. The study

emphasizes that teachers' perceptions of ICT significantly influence their attitudes towards its use in teaching. These attitudes, in turn, impact the curriculum delivery process and overall performance in the classroom. Teachers who view ICT positively are more likely to incorporate it effectively into their teaching strategies, thereby enhancing both pedagogical practices and student outcomes.

Warioba *et al*. (2022) further support this perspective by noting that teachers are generally more inclined to adopt ICT when they perceive it as a vital tool for improving pedagogy and student performance. The study highlights that the perception of ICT as an essential teaching strategy can lead to a more enthusiastic and engaged use of technology in the classroom.

Similarly, Bai *et al.* (2024) argue that teachers' attitudes towards technology have a direct impact on their willingness to integrate it into their teaching and learning processes. If teachers perceive ICT as a beneficial tool for facilitating instruction, fostering student interactivity, and enhancing educational performance, they are more likely to use it effectively. This positive attitude towards technology adoption can lead to more innovative and effective teaching practices.

In Germany, teachers' attitudes towards ICT integration are of paramount importance. It is recommended that teachers have ample opportunities to engage with technology and develop skills for integrating it into their teaching. The effectiveness of ICT incorporation is closely linked to teachers' attitudes, making it essential for educators to be well-prepared and confident in their use of technology.

Conversely, Hong *et al*. (2022) identifies several challenges that can create a disconnect between teachers' positive attitudes and actual ICT use. Their study points out that inadequate ICT skills, insufficient ICT infrastructure, limited availability of digital devices,

and lack of support from school management can hinder effective technology integration. These factors suggest that while teachers' attitudes are necessary, they are not the sole determinants of successful ICT integration. Addressing these barriers through targeted professional development, improved infrastructure, and enhanced support systems is crucial for bridging the gap between teachers' attitudes and their actual use of technology.

Therefore, ongoing investigations into teachers' attitudes towards technology, coupled with efforts to address the practical challenges of technology integration, are essential for ensuring that ICT can be effectively incorporated into the curriculum. Understanding and addressing both the attitudinal and infrastructural aspects of technology integration will contribute to a more successful and impactful use of technology in education.

2.3.4 Teacher in-service training

A quantitative study conducted by Zenda and Dlamini (2023) explored the factors that influence teacher abilities, motivation, and perceived student learning in technology-enabled classrooms. Their research highlights the critical role of professional development in facilitating the successful integration of technology in educational settings. The study found that teachers who receive ongoing professional development are better equipped to effectively incorporate technology into their teaching practices, thereby enhancing their instructional strategies and improving student outcomes.

Despite the broad recognition of technology's benefits in education, there remains a notable gap in the practical application of these technologies in the classroom. Autor (2014), points out that although educators firmly intend to integrate technology, many teachers still lack adequate training in their teacher education programs. This shortfall in preparation contributes significantly to the inconsistent use of technology in educational practice.

Teachers often face challenges in effectively utilizing technology due to insufficient exposure and hands-on experience during their training.

Zenda & Dlamini (2023) suggest that addressing this issue requires integrating opportunities for practical experience with technology into teacher training programs. They advocate for embedding technology practice into both initial teacher education and ongoing professional development courses. By providing educators with hands-on experience and practical applications of technology, training programs can help teachers better understand how to leverage technology to enhance classroom activities, engage students, and support their learning. This approach aims to bridge the gap between theoretical knowledge and practical implementation, ensuring that teachers are well-prepared to use technology effectively in their teaching.

A study conducted in Italy by F.m *et al.*, (2024) examined the impact of technology training on the use of technology by teachers, specifically in the context of mathematics instruction. The study found that practical ICT training significantly influences how teachers integrate technology into their teaching practices. This practical training is crucial as it directly affects teachers' ability to adopt and effectively utilize ICT tools in their classrooms. By engaging in hands-on training, teachers can better understand the functionalities and applications of various technologies, leading to more innovative and effective teaching strategies.

Supporting this view, Azanza *et al.,* (2024) highlight that teachers' level of technology competence plays a critical role in their overall efficacy and in determining how technology is incorporated into instructional delivery. Teachers who possess a higher level of technological competence are better equipped to integrate ICT into their teaching practices, which can enhance their effectiveness and improve student learning outcomes. The

competence gained through targeted technology training allows teachers to use technology more confidently and creatively, leading to more engaging and interactive lessons.

In a related study, Gomez Garcia *et al.,* (2020) explored the relationship between teachers' use of ICT and the quality of their training. The study identified a positive correlation between the extent of technology training received by teachers and their actual use of ICT in the classroom. The researchers concluded that high-quality training is essential for enabling teachers to implement technology in their teaching effectively. They emphasized that since teachers are pivotal in the successful integration of ICT, it is critical to provide them with comprehensive support and adequate resources. This support includes not only professional development but also access to technological tools and infrastructure that can facilitate effective technology use.

The findings from these studies suggest that more attention should be directed towards enhancing the training and support provided to teachers. As primary facilitators of technology integration in education, teachers serve as role models for their students. Therefore, ensuring that they have the necessary skills, knowledge, and resources is vital for maximizing the benefits of ICT in the classroom. By focusing on the professional development of teachers, educational institutions can improve technology adoption rates and foster a more technologically advanced learning environment for students.

Moreover, Alieto *et al.,* (2024) highlights a critical gap in teacher education, many educational institutions emphasize teaching teachers how to use technology in classrooms rather than providing a comprehensive understanding of the technology itself. This approach focuses primarily on the practical application of technology tools without delving deeply into the underlying principles, functionalities, and broader implications of these technologies.

This issue is particularly pronounced in Kenya. ICT training programs for teachers often concentrate on basic technology literacy, which includes familiarizing educators with the use of software applications and digital tools. While this foundational training is important, it tends to fall short of equipping teachers with the more profound knowledge and skills needed for effective ICT integration into instructional delivery. The emphasis on technology literacy may not fully address the complexities involved in leveraging technology to enhance teaching practices and support student learning.

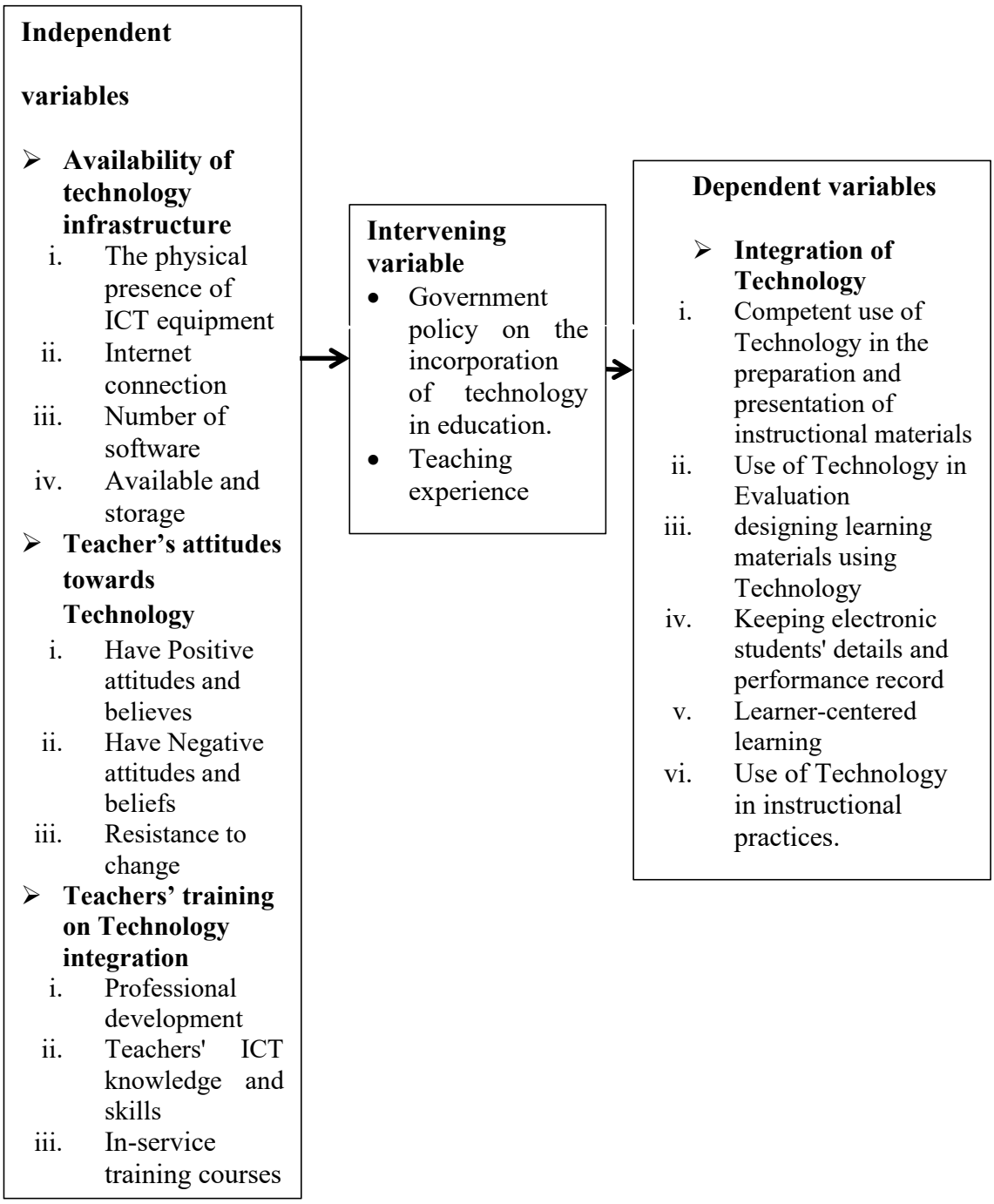
As a result, secondary school teachers in Kenya may struggle to integrate ICT effectively into their teaching methods. They might lack the advanced understanding required to use technology in innovative ways that go beyond basic functionalities. This gap in training can hinder their ability to utilize technology to its full potential, affecting the quality of instruction and the overall impact on student learning outcomes.

To address this issue, teacher education programs need to expand their focus beyond basic technology literacy. Educators need to be trained not only in the operational aspects of technology but also in how to apply it strategically within their instructional practices. This includes understanding how different technologies can support various teaching strategies, enhance student engagement, and facilitate personalized learning. By providing a more holistic approach to ICT training, teacher education institutions can better prepare educators to integrate technology effectively into their classrooms, ultimately leading to improved educational experiences and outcomes for students.

2.4 Conceptual Framework

Figure 2. 1

Conceptual Framework



The study used the conceptual framework illustrated in Figure 2.1 to demonstrate how certain independent variables, such as the availability of technological infrastructure, teachers' attitudes, and teacher in-service training, impact the incorporation of ICT in instructional delivery. According to the conceptual framework, if teachers possess strong ICT skills and positive attitudes, they will effectively utilize technology to create and present instructional materials, develop technology-enhanced learning activities, and maintain electronic records of students' attendance and performance.

Availability of adequate infrastructure in technology will make the utilization convenient. This will be ensured by government provision of technology equipment's which are enough for use in public secondary schools. Maintenance of technological equipment's at school is very important. There should be a safe storage facility and a computer technician for the purpose of repairing and ensuring this equipment are regularly used in teaching and learning in secondary schools.

Positive attitude of teachers is very important because it will create interest for them and influence use of technology or computers in teaching and learning even during their own time. The government should ensure teachers are trained on technology skills at college and those in the field are taken for technology workshops as this will enable them to have effective utilization of technology in public secondary schools without challenges.

CHAPTER THREE: RESEARCH METHODOLOGY

3.0 Introduction

This chapter outlines the study's methodology, including the research design, sampling framework, target population, sampling methods and sample size, research instrument, piloting, reliability, validity, data collection techniques, data analysis, and ethical and logistical considerations.

3.1 Research Design

The study utilized a descriptive survey design to collect both quantitative and qualitative data, offering a comprehensive view of technology integration in secondary schools. This design was effective in assessing teachers' preparedness for incorporating technology into their teaching methods by providing measurable data on current technology use, as well as detailed insights into teachers' attitudes, experiences, and needs. Quantitative data allowed for statistical analysis of technology usage and infrastructure, while qualitative data enriched the understanding of teachers' perceptions and challenges. This approach facilitated a thorough investigation into how technology is integrated into education and highlighted areas for improvement, making it well-suited for informing policy and practice in educational technology integration (Pandey & Pandey, 2021).

3.2 Study Location

The study took place in Tigania West Sub-County, which included 51 secondary schools spread across five wards: Kianjai Ward (19 schools), Akithi Ward (11 schools), Nkomo Ward (10 schools), Mbeu Ward (7 schools), and Athwana Ward (4 schools). Out of 51 secondary schools,50 are public secondary schools and one is a private secondary school. The study

only focused on public schools due to a government initiative to improve technology integration in STEM education by providing technological tools to selected schools.

3.3 Target Population

The target population in Tigania West Sub-County consists of 350 respondents, 50 principals, 100 heads of departments, and 200 teachers from 50 public secondary schools in the Sub-County. The Sub-County has five wards: Kianjai Ward, Akithi Ward, Nkomo Ward, Athwana Ward, and Mbeu Ward. This information is presented in Table 3.1.

Table 3.1

Target Population

Ward	Schools	Principals	Heads of departments	Teachers	Total Population
Kianjai ward	19	19	38	76	133
Akithi ward	11	11	22	44	77
Nkomo ward	9	9	18	36	63
Mbeu ward	7	7	14	28	49
Athwana ward	4	4	8	16	28
Total	**50**	**50**	**100**	**200**	**350**

Source: Tigania West Sub-County Education Office 2024

3.4 Sampling Techniques and Sample Size

3.4.1 Sampling techniques

The study used a stratified random sampling technique to categorize 50 public secondary schools in Tigania West Sub-County into 5 strata. Five schools were randomly selected from

Kianjai Ward, which has the highest number of schools; four were selected from Akithii Ward, three from Nkomo Ward, two from Mbeu Ward, and one from Athwana Ward. There were 15 schools in each stratum, and principals, heads of departments, and teachers from these schools participated in the study. Schools were randomly chosen from each stratum to minimize bias. All extra county schools in the study area were interviewed since no national schools were present. In each stratum, one county school and one sub-county school were interviewed. Additionally, one school from two large strata was interviewed. Teachers were randomly selected from all schools for the study. The researcher chose this method to compare schools with integrated technology and those without access to the extent of technological incorporation in the Tigania West sub-county.

3.4.2 Sample size

Fifteen principals, 30 heads of departments, and 60 teachers represent 30% of the total population. These individuals were randomly selected from the sampled schools. According to Laamanen *et al.* (2024), a descriptive study can be conducted with a sample size of 10-30% of the accessible population. Therefore, the sample size in this case was 105 respondents.

Table 3.2

Sample Size

Category	**Population**	**Sample Size (30%)**
Principals	50	15
Heads of departments	100	30
Teachers	200	60
Total	**350**	**105**

3.5 Research Instruments

Research instruments such as questionnaires, interview schedules, and observation schedules were used to gather respondents' data to evaluate teacher readiness in incorporating technology in public secondary schools in the Tigania West sub-county.

3.5.1 Questionnaires

Questionnaires were selected as the primary data collection method for this study due to their ability to provide quantifiable data that can be subjected to statistical analysis, facilitating a clear understanding of trends and patterns (Jr *et al.,* 2019). This method was particularly valuable for efficiently and systematically gathering data from a large number of respondents, such as department heads and teachers.

The use of questionnaires ensured consistency in data collection by presenting all respondents with the same set of questions, thereby reducing variability in the data and allowing for reliable comparisons across responses (Breakwell *et al.*, 2020). This uniform approach helps to ensure that each participant's responses are based on the same criteria, which is essential for maintaining the integrity and validity of the study's findings.

To capture a comprehensive range of information, the study employed both closed-ended and open-ended questions. Closed-ended questions provided structured responses that could be easily quantified and analyzed statistically, such as yes/no answers or rating scales. This format enabled the researchers to gather specific, measurable data on various aspects of technology integration and teacher preparedness.

In contrast, open-ended questions allowed respondents to provide more detailed, nuanced answers, offering deeper insights into their experiences, attitudes, and challenges. This format helped to uncover aspects of technology integration that might not be captured

through closed-ended questions alone, and it provided participants the opportunity to express their thoughts and opinions more freely.

The flexibility of questionnaires also give participants ample time to consider and respond to the questions at their own pace(Malmqvist *et al.,* 2024). This is particularly important for obtaining thoughtful and reflective responses, as participants were not constrained by time during the data collection process.

Furthermore, the open-ended nature of some questions minimized potential bias from researchers. By allowing respondents to articulate their views without being led by predefined response options, the study reduced the influence of researcher assumptions and biases on the data. This approach provided a more authentic representation of participants' perspectives on technology integration in education.

3.5.2 Interview guide

In this study, an interview schedule was administered to school principals to collect detailed and context-rich information that might not have been fully captured through questionnaires. The interview schedule consisted of open-ended questions designed to encourage principals to express their views, share experiences, and elaborate on specific aspects of technology integration in their schools.

Unlike questionnaires, which often limit responses to fixed choices or brief statements, the open-ended nature of interviews allowed for in-depth exploration of complex issues. Principals could explain their schools' unique circumstances, challenges faced in adopting technology, and the strategies they employed to support teachers and students. This format encouraged personal reflection, enabling the researchers to gain insights into attitudes, beliefs, and school-specific factors influencing the use of technology in teaching.

The interviews also allowed for real-time engagement, where interviewers could ask follow-up questions, clarify unclear responses, and probe deeper into significant points raised by the respondents. This interactive process was valuable in uncovering information that might otherwise remain hidden in a standardized questionnaire.

Additionally, the interviews enhanced the reliability and validity of the findings by providing a richer, more understanding of the data. For example, where questionnaire responses might have appeared inconsistent or unclear, the interviews helped contextualize and explain those variations. Through this method, the study captured the lived experiences and practical realities of principals, offering a comprehensive perspective on how technology is being integrated or hindered in secondary school settings.

The interview guide played a critical role in complementing the quantitative data by adding depth, clarity, and human context, thereby strengthening the overall findings of the research.

3.5.3 Observation schedule

The observation schedule was a vital instrument used to gather firsthand, objective data on the actual availability and utilization of technological resources in public secondary schools. It was designed to guide the researcher in systematically assessing the presence and condition of various technological tools, including computer hardware such as desktops, laptops, and servers, software such as educational programs, productivity tools, and learning management systems, and external devices such as input devices like keyboards, mice, projectors, and printers.

This schedule functioned as a structured checklist that ensured the researcher observed the same elements across all sampled schools, promoting consistency in data collection. Unlike self-reported data, which may be influenced by personal biases or inaccurate recall,

observational data provided a direct and reliable account of the technological infrastructure present in the schools.

The use of an observation schedule enhanced the accuracy and objectivity of the findings by minimizing researcher bias and subjectivity. It allowed the researcher to independently verify the claims made during interviews or questionnaires, thereby strengthening the validity and reliability of the overall research. For example, where teachers or principals might have indicated that they had access to adequate ICT tools, the observation schedule enabled the researcher to confirm whether those resources were indeed available, functional, and being used appropriately.

Furthermore, the observation process gave insight into the practical realities of technology integration within the learning environment. It provided visual evidence of how equipment was arranged, whether it was accessible to students and teachers, and if it appeared regularly used or idle. This helped reveal gaps between policy implementation and actual practice.

The observation schedule complemented other data collection tools by adding a layer of empirical verification. It ensured that data collection was systematic, comprehensive, and evidence-based contributing significantly to the credibility, depth, and overall integrity of the study.

3.6 Pilot Study

A pilot study was conducted in Imenti North to evaluate the reliability and validity of the research tools employed in the study, following the methodology outlined by Aithal and Aithal (2020). This preliminary survey aimed to test the effectiveness of the research instruments and ensure they met the required standards for accuracy and objectivity.

Imenti North was selected due to its convenience and proximity to the researcher. In this area, a random selection process was used to choose one school from Ntima west ward and Municipality ward a total of 2 schools. The study included a range of participants from public secondary schools, specifically targeting one within the municipality to check if they had any special training on technology compared to the teachers in the study area which has no municipality. The respondents were selected from each school, one principal, one head of department, and one teacher from each selected school. This selection provided a representative sample of key stakeholders involved in the educational process.

The primary objectives of the pilot survey were to assess the research tools against established benchmarks and identify any potential issues or ambiguities in the instruments. By analyzing the responses from the pilot study, the researcher could determine the effectiveness of the tools in capturing accurate and reliable data. This process involved careful examination of the responses to ensure that the questions were clear, relevant, and capable of eliciting objective and meaningful information.

Conducting the pilot study allowed for refining the research tools before the main study. It helped address any identified ambiguities and ensure the tools were appropriately designed to yield valid results. This step was crucial for enhancing the overall quality of the research by validating that the instruments would function as intended in the actual study, thereby contributing to the robustness and credibility of the research findings.

3.6.1 Validity of the study instrument

In this study, the validity of the research instrument was ensured through a rigorous assessment of content validity conducted in two main stages. First, the instrument was carefully developed based on the study's objectives and research questions, with each item

designed to address a specific aspect of the variables under investigation. This ensured comprehensive coverage of key concepts related to teachers' attitudes toward technology integration. In the second stage, each item was critically reviewed for clarity, simplicity, and relevance to the study's aims. The researcher ensured that the language used was straightforward and easily understandable by the respondents to minimize misinterpretation. To further strengthen content validity, experts in education and research methodology were consulted to review the instrument and provide feedback. Their input helped refine the items to ensure they effectively captured the intended constructs. This thorough process enhanced the instrument's ability to collect accurate and meaningful data relevant to the study.

3.6.2 Reliability of the study instruments

A reliable instrument yields consistent results when repeated several times or whenever a measurement is taken (Guo *et al.,* 2021). It is essential to quantify the data reliability to understand the relationship between different data items. The pilot study was carried out in two schools in the Imenti North sub-county. The test was given to an appropriate group selected randomly. The two scores were correlated using Pearson's product-moment correlation coefficient formula to determine the correlation coefficient (r) between them.

$$r = \frac{n\sum xy - (\sum x)(\sum y)}{\sqrt{[[n\sum x^2 - (\sum x)^2)][n\sum y^2 - (\sum y)^2]]}} \quad (3.1)$$

Where x= represents the first set of scores; y = represents the second set of scores; ∑ x= represents the sum of the first set of scores; ∑y= represents the sum of the second set of scores; $\sum x^2$= represents the sum square of the first set of scores. $\sum y^2$ = represents the sum square of the second set of scores; ∑ represents the sum of the cross product of x and y and the total number of respondents. As per the Cheung *et al.,* (2024), a reliability coefficient

above 0.80 is considered satisfactory. The reliability coefficient of the instrument was found to be 0.90.

3.7 Data Collection Procedures

The researcher followed a systematic procedure to ensure the study's compliance with regulatory and institutional requirements. Initially, the researcher secured necessary permits from the National Commission for Science, Technology, and Innovation (NACOSTI) and the school of education at Meru University of Science and Technology, which authorized the study's implementation. With these permits, the researcher then notified the MOE to inform them of the study's scope and objectives. Subsequently, permission was obtained from the principals of the selected schools, and were requested to inform their respective heads of departments and teachers.

Once permissions were granted, the data collection process commenced. Interviews were scheduled and conducted with the school principals to gain their insights and perspectives on the study’s focus. Once the interview was done, the researcher filled the observation schedule from the computer laboratory. In parallel, questionnaires were distributed to the selected respondents, who were given one week to complete and return them. To ensure timely submission, the respondents were clearly informed of the deadline for returning the completed questionnaires. At the end of the designated period, a research assistant revisited each school to collect the completed questionnaires, ensuring the collection process was organized and efficient. This structured approach helped to facilitate smooth data collection while adhering to ethical and administrative protocols.

3.8 Data Analysis Methods and Procedures

Data analysis in this study involved a dual approach to effectively handle quantitative and qualitative data. For quantitative data, statistical techniques such as calculating the mean, frequency, and percentages were employed to summarize and interpret numerical information. These results are presented through frequency tables, bar graphs, and pie charts created in Excel, which visually illustrate patterns and trends. On the other hand, qualitative data from open-ended questions were analyzed using content analysis. This method involved organizing responses into themes, categorizing and coding the data to identify recurring patterns, and determining the frequency of various descriptions. By combining these approaches, the study ensured a comprehensive understanding of the data, with statistical methods providing a broad overview and content analysis offering detailed insights into participants' perspectives.

3.9 Logistical and ethical considerations

In addressing logistical and ethical considerations, the researcher took deliberate and comprehensive steps to uphold the highest standards of research integrity and participant protection. Measures were put in place to ensure the confidentiality and privacy of all respondents. Personal identifiers such as names, schools, or any specific markers that could reveal participants' identities were excluded from the final data to maintain anonymity. All data collected were securely stored and accessed only by the researcher, strictly for academic purposes, and were not shared with any unauthorized individuals or institutions. Participation in the study was entirely voluntary, and informed consent was obtained from each respondent before data collection began. Participants were fully briefed on the nature, purpose, and scope of the research, including their right to decline participation or withdraw

from the study at any stage without facing any negative consequences. This transparency was crucial in fostering trust and ensuring that participants felt safe and respected. The researcher adhered to ethical guidelines approved by the relevant academic and institutional bodies, including ensuring that the research tools and procedures did not cause psychological, emotional, or physical harm to participants. Careful planning and coordination were also undertaken to ensure minimal disruption to the school schedule and learning environment during data collection. By integrating these ethical and logistical considerations, the researcher demonstrated a strong commitment to conducting a responsible, respectful, and ethically sound study.

CHAPTER FOUR: RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents data analysis, data presentations and discussions of the results. The study gauged teacher preparedness to integrate technology into teaching public secondary schools in the Tigania West sub-county, Meru, Kenya.

4.2 Response Rate

The study aimed to find out the respondents' response rate. The analysis showed that out of 105 respondents, 92 completed and returned the questionnaires, leading to an overall response rate of 87.6%. 100% respondent rate was not arrived at due to time constrains of participants. According to Wilson *et al*., (2024) 70 percent and above response rate is considered reasonable, making the overall response rate of 87.6% commendable. The substantial response rate was primarily attributed to the involvement of a research assistant, who personally contacted respondents and explained the purpose of the study with the help of school principals.

4.3 Demographic Information

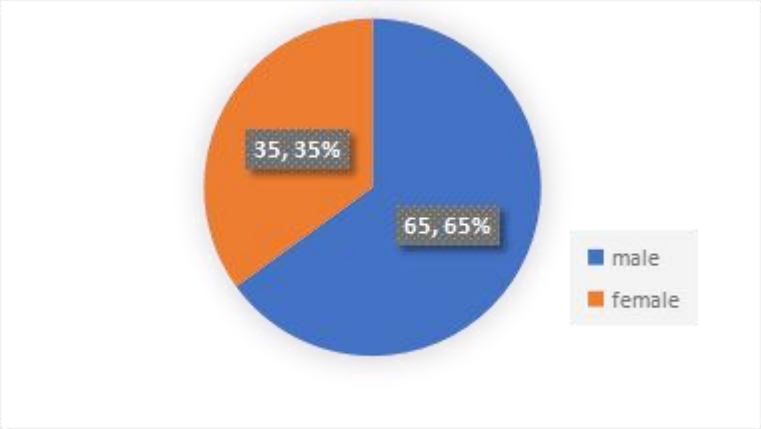
In the first section of the surveys given to school administrators and educators, were asked about basic demographic details, including gender, age, level of education, and years of teaching experience.

4.3.1 Gender respondent’s rate

The study aimed to determine the respondents' gender, as shown in **Figure 2**.

Figure 2

Gender Respondents Rate



Based on the study findings, 65% of the respondents were male, and 35% were female.

4.3.2 Age of the respondents

The study aimed to determine the respondents age as showed in **table 4.1**

Table 4.1

Age of Respondents

Age	Frequency	Percentage
Below 30 years	22	23.9
31-40 Years	42	45.7
41-50 Years	20	21.7
51-60 Years	8	8.7
Total	**92**	**100**

From the data, 23.9% of the respondents were under 30 years old, while the majority—45.7%—were between 31 and 40 years old. Additionally, 21.7% were between 41 and 50 years, and only 8.7% were in the 51–60 age bracket. This distribution shows that most

respondents (67.4%) are aged between 31 and 50 years, representing mid-career professionals likely to have accumulated significant teaching experience.

The predominance of respondents in the 31–40 age group suggests a teaching workforce in their prime professional years, which could positively influence technology integration due to a balance of experience, adaptability, and familiarity with digital tools. Research by (Mirsanjari, 2025) noted that younger and mid-career teachers are often more receptive to adopting new technologies compared to their older counterparts, who may face greater barriers due to limited digital literacy or reluctance to change.

Furthermore, the smaller proportion of respondents aged above 50 years (8.7%) reflects findings from a study by (Abedi, 2024), which indicated that older teachers tend to rely more on traditional teaching methods and often require additional support and training to effectively use ICT in instruction. This age dynamic underscores the importance of targeted professional development programs tailored to different age groups, ensuring all educators are equipped to integrate technology regardless of their stage in career.

The age distribution aligns with trends observed in other Kenyan educational settings, where a relatively youthful and middle-aged teaching population is at the forefront of pedagogical innovation and technology adoption.

4.3.3 Professional qualification

The study aimed to identify the educational levels of the participants, as detailed in **Table 4.2**

Table 4.2

The Respondent's Education Level

Qualification	Frequency	Percentage
Diploma education without a computer	2	2.2
Diploma education with computer	8	8.7
Bachelor of education with the computer as a teaching subject	5	5.4
Bachelors of education without a computer teaching subject	70	76.1
Masters	5	5.4
Untrained	2	2.2
Total	**92**	**100**

Table 4.2 provides a detailed breakdown of the professional qualifications of the study participants. The data reveals the educational levels of the respondents, which are crucial for understanding their preparedness and capability to integrate ICT into their teaching practices. According to the data, a significant majority of the respondents, 76.1%, hold a Bachelor of Education degree without a computer teaching subject. This indicates that a substantial portion of the teachers have attained a standard level of educational qualification necessary for their roles. Additionally, 5.4% of the participants have a Bachelor of Education degree with the computer as a teaching subject, and another 5.4% hold a Master's degree. The presence of these advanced qualifications suggests that there are some highly qualified individuals within the group.

However, it is notable that only 14.1% of the respondents possess additional qualifications related to computer technology, including diplomas with computer training or other relevant certifications. Specifically, 8.7% have a diploma in education that includes computer training, and 2.2% have a diploma without computer training. Furthermore, 2.2% of the respondents are untrained, meaning they lack formal educational qualifications relevant to their teaching roles.

The data highlights a potential concern while most teachers in the sample are well-qualified in their core subject areas, a relatively small proportion have formal training in computer technology. This limited computer-related training could pose challenges for integrating ICT into teaching practices effectively. The lack of computer qualifications among a significant percentage of teachers may hinder their ability to utilize technology fully, which is crucial for enhancing instructional delivery and supporting student learning in the digital age.

In public secondary schools in Tigania West Sub County, this gap in computer qualifications might impact the overall integration of ICT in the curriculum. Teachers with limited or no formal computer training may struggle to incorporate technology into their teaching, affecting the quality of education and the potential benefits that technology can bring to the classroom.

4.3.4 Respondent teaching experience

The study aimed to find the duration of teachers' period at their schools. **Table 4.3** summarizes the results.

Table 4.3

Respondents' Teaching Experience

Years	Frequency	Percentage
1-5years	18	19.7
5-10 years	46	50.0
11 - 15 years	20	21.7
16 – 20 years	5	5.4
Over 20 years	3	3.3
Total	92	100.0

The data indicates that a majority of respondents (50%) had between 5 and 10 years of teaching experience, suggesting that most participants were in their mid-career phase. This group is typically characterized by stability in professional roles and a growing openness to incorporating innovative practices such as educational technology. According to (Daulay et al., 2024) teachers in this stage often have developed classroom management skills and pedagogical confidence, which may positively influence their willingness to integrate ICT into teaching.

Additionally, 21.7% of respondents had 11–15 years of teaching experience, representing a group with deeper professional expertise and potential for mentorship in ICT use. On the other hand, 19.7% had between 1–5 years of experience, reflecting a relatively young and potentially more tech-savvy cohort of teachers who may be more adaptable to modern tools but may require more instructional support and guidance.

A smaller proportion of respondents had long-term teaching experience: 5.4% had been teaching for 16–20 years, and only 3.3% had over 20 years of experience. These findings align with study by (Smith, 2025), which observed that older or more experienced teachers sometimes exhibit reluctance or limited confidence in using digital tools, often due to unfamiliarity or lack of formal ICT training during their formative teaching years.

The diversity in teaching experience highlights the need for differentiated professional development programs. While newer teachers may benefit from pedagogical integration strategies, more experienced teachers may require targeted training and support to overcome resistance or skill gaps in using technology effectively in instruction.

4.4 Descriptive Statistics

Descriptive statistics, such as means, pie charts, and bar graphs, were utilized to present quantitative data in an Excel sheet. This data covers the availability of technology infrastructure, teachers' attitudes towards ICT integration, and teachers' training in ICT as per the study objectives discussed below:

4.4.1 Availability of technology infrastructure in secondary schools

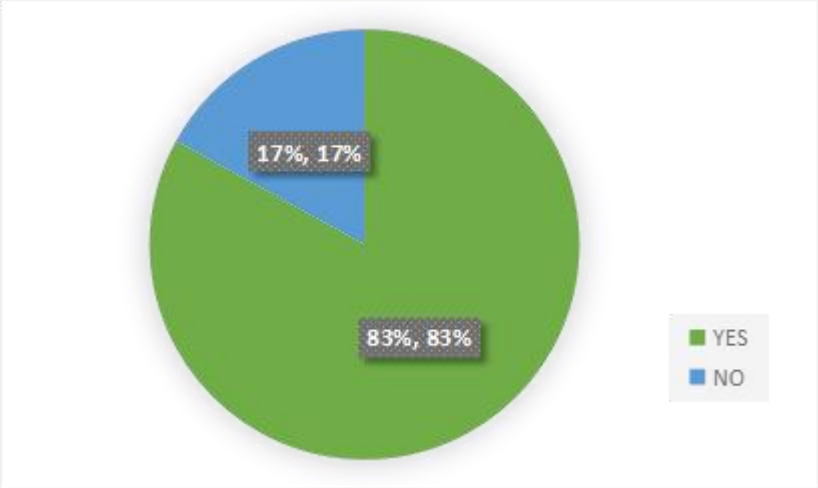
The study investigated the impact of technology infrastructure availability on its integration into teaching and learning. Specifically, the study focused on three areas: the availability of a computer laboratory, internet connectivity, and accessible ICT hardware. The findings from each area were discussed below.

(a) Availability of a Computer Laboratory for Instruction

Teachers were asked if schools had computer laboratories for educational purposes.

Figure 3

Availability of Computer Laboratories for Teaching and Learning



The findings indicate that **83%** of teachers affirmed the presence of computer laboratories in their schools, while **17%** reported that their schools lacked such facilities. This suggests that a significant majority of schools in Tigania West Sub-County have made progress in establishing ICT infrastructure, which is a foundational element in the successful integration of digital tools into instruction.

The availability of computer laboratories plays a critical role in supporting not only the teaching of computer studies but also in enabling the broader application of technology across subjects. According to Kumbo *et al.* (2023), access to technological infrastructure is a primary determinant of effective technology adoption in schools. Schools with functional, well-equipped labs create an enabling environment for both students and teachers to develop ICT skills and integrate technology into daily classroom activities.

Furthermore, recent studies reinforce these findings. For instance, Mwendwa and Wanjohi (2022) found that the availability of computer labs significantly influences teachers' ability to incorporate technology into teaching, particularly in rural and semi-rural contexts. In

schools where such infrastructure is lacking, integration efforts are often limited to theoretical instruction or sporadic use of mobile devices, which do not offer the same level of engagement or skill development.

Similarly, a national study by Odhiambo and Kiplangat (2021) noted that the mere presence of ICT tools is not sufficient schools must ensure that these labs are adequately maintained, updated with relevant software, and supported by trained personnel. The findings from Tigania West align with these conclusions, as the presence of computer labs in most schools reflects ongoing efforts by school administrations and the government to enhance digital learning capabilities.

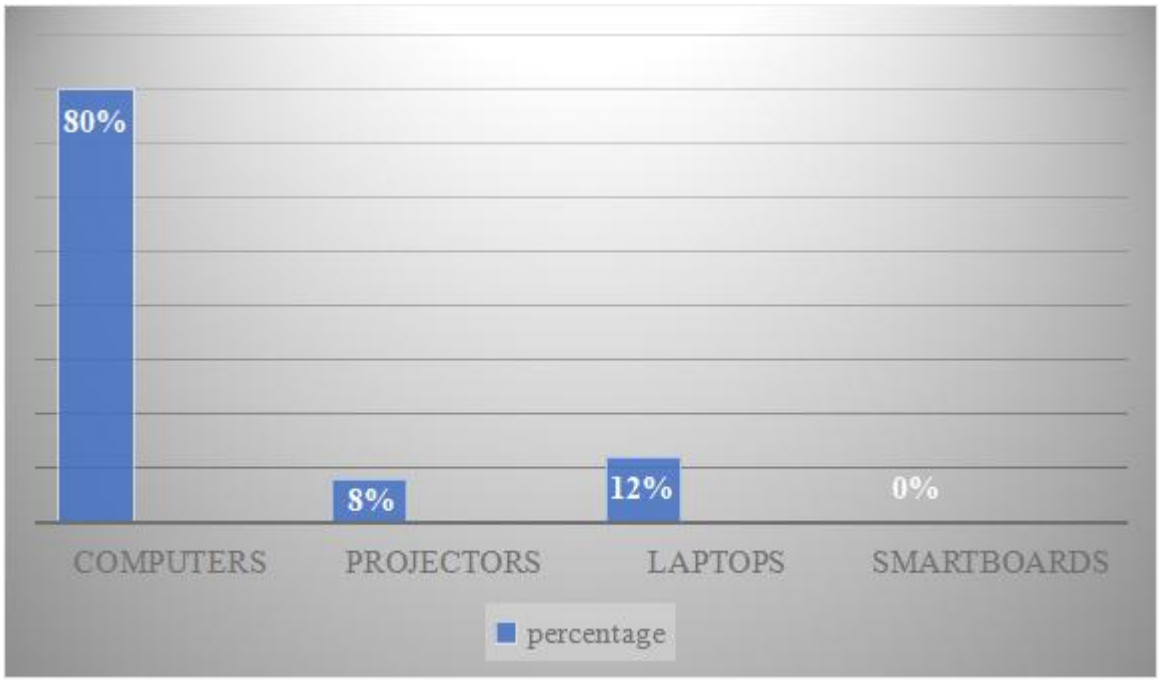
In conclusion, while the presence of computer laboratories in most schools is commendable, efforts must continue to ensure that all schools have access to such facilities and that these labs are well-equipped and properly integrated into the teaching and learning process.

(b) Available hardware for instruction delivery

Educators were requested to list the hardware available in schools for instruction delivery.

Figure 4

Availability of Computer Laboratories for Teaching and Learning



The data presented in Figure 4.3 shows that **80% of schools** had desktop computers available for educational purposes. However, only **12%** reported having laptops, and **8%** had projectors. Notably, none of the surveyed schools had access to interactive smart boards an advanced instructional tool that can significantly enhance digital learning experiences through interactivity and multimedia engagement.

These findings suggest that while a majority of schools have made strides in providing basic digital tools primarily computers the overall range and sophistication of instructional hardware remains limited. The absence of smart boards and minimal availability of projectors and laptops indicate a gap in the availability of more dynamic and flexible instructional technologies.

According to Spaska *et al.* (2025), effective technology integration in classrooms requires not just the presence of computers, but also up-to-date software, mobile devices such as

laptops and tablets, and interactive tools that allow for collaborative, student-centered learning. Where technology is limited to desktop use only, opportunities for personalized learning, group activities, and mobile instruction are greatly constrained.

Furthermore, the findings align with Chesoli and Wachira (2022), who observed that many Kenyan secondary schools struggle to acquire diverse ICT hardware due to budget constraints, inadequate technical support, and lack of infrastructure. This limited access affects how broadly and effectively technology can be used across the curriculum.

The minimal availability of projectors, for example, restricts the use of multimedia resources such as videos, animations, and slide presentations, which are known to improve student engagement and understanding. The lack of laptops also limits teacher mobility and flexible lesson delivery, especially in schools where multiple classes need to share the same resources.

In conclusion, while the presence of computers in 80% of schools is a positive indicator of progress, the limited diversity of available hardware poses a significant barrier to full technology integration. Addressing this hardware gap is crucial for achieving equitable, interactive, and effective digital learning environments.

(c) Internet Connectivity

Teachers were requested to indicate if their schools had internet access. **Table 4.4** shows the results.

Table 4.4

Internet Connectivity

Connected to the internet	Frequency	Percentage
Yes	51	91.1
No	5	8.9
Total	**56**	**100.0**

The data reveals that a significant majority (91.1%) of the sampled schools had internet connectivity, indicating commendable progress in equipping schools with basic digital infrastructure. However, 8.9% of the schools lacked internet access, which remains a critical gap in achieving equitable technology integration.

According to ElSayary (2024), internet access is essential in modern education, enabling access to digital learning platforms, research databases, virtual classrooms, and up-to-date teaching materials. In schools with internet connectivity, teachers are more likely to utilize online resources for lesson preparation, incorporate digital tools in instruction, and engage students with interactive and multimedia content.

However, the minority of schools without internet access are at a clear disadvantage. As Mutisya and Wekesa (2023) point out, limited or no internet connectivity in schools hinders the effective implementation of ICT strategies, especially those aligned with Kenya's Digital Literacy Programme (DLP). Teachers in such schools are often unable to access e-learning platforms, attend virtual training sessions, or integrate real-time online tools into classroom instruction.

The findings emphasize the need for policy makers and education stakeholders to ensure not only the physical availability of devices but also robust internet connectivity across all schools. Without reliable access, even schools equipped with hardware may be unable to maximize the benefits of ICT in teaching and learning.

In conclusion, while the high percentage of connected schools is encouraging, efforts must be intensified to achieve 100% internet access to ensure inclusivity and uniform implementation of digital learning strategies.

(d) The Impact of Technology Infrastructure on Instructional Delivery

The heads of the department were requested to give their opinions on how technology infrastructure influences technology incorporation in instructional delivery. The findings are presented in **Table 4.5**.

Table 4.5

The Impact of Technology Infrastructure on Instructional Delivery

Opinion	Frequency	Percentage
Some facilities are old and poorly maintained	4	16
Few teachers use technology in teaching some concepts, though not all teachers, due to poor infrastructure	21	84
Total	**25**	**100.0**

Table 4.5 presents the views of Heads of Departments (HoDs) regarding the state of technology infrastructure and its effect on instructional delivery in secondary schools in Tigania West Sub-County. The majority of respondents (84%) indicated that only a few teachers were able to use technology to teach specific concepts, largely due to poor

infrastructure. Additionally, 16% reported that the available facilities were outdated and poorly maintained, further limiting the potential for effective technology integration.

These findings reflect a broader concern about the inadequacy of ICT infrastructure, which remains a significant barrier to the effective use of digital tools in education. Although some teachers are attempting to incorporate technology into their lessons, their efforts are constrained by unreliable or insufficient facilities. This aligns with earlier findings from Nyaga and Musau (2022), who noted that the age and condition of ICT equipment in many Kenyan public schools are major deterrents to consistent use in classroom settings.

Furthermore, HoDs in the study estimated that approximately 70% of their department members made some use of technology in instruction. However, they also emphasized that not all staff could do so due to infrastructural limitations—ranging from outdated hardware, lack of internet reliability, to insufficient maintenance and technical support.

The fact that 30% of HoDs explicitly cited poor maintenance and outdated resources highlights the urgent need for regular upgrades and the establishment of maintenance policies for ICT facilities. Without these, even the presence of basic technology cannot translate into effective teaching and learning outcomes.

In conclusion, the findings from Table 4.5 underscore a critical issue: the successful integration of technology in Tigania West's public secondary schools is not solely about access to devices, but also about ensuring that the infrastructure is modern, functional, and well-maintained. Addressing these gaps is essential for enabling all teachers—not just a few to use technology effectively in instructional delivery.

(e) School Principals' Opinions on Utilization of Technology in Teaching

School principals were requested to give their opinions on the factors preventing teachers from utilizing technology in teaching when infrastructure is available. **Table 4.6** presents the findings.

Table 4.6

School Principals' Opinions on Utilization of Technology in Teaching

Opinion	Frequency	Percentage
Time constraints	8	72.7
Some teachers have a significant workload	3	27.3
Total	**11**	**100.0**

Table 4.6 presents the views of school principals regarding factors that limit the effective use of technology in teaching. A majority of principals (72.7%) identified time constraints as a key challenge preventing teachers from integrating technology into their instructional practices. The remaining 27.3% pointed to the significant workload that teachers manage as a barrier to technology utilization.

These findings suggest that even in schools where technological infrastructure is present, practical limitations related to teachers' daily schedules and responsibilities significantly hinder technology integration. The teaching profession involves numerous tasks beyond classroom instruction, including lesson planning, grading, co-curricular responsibilities, and administrative duties. When these demands are high, teachers may find it difficult to explore or implement new technological tools, despite understanding their value.

This is supported by Çatalbaş and Solmaz (2024), who observed that successful integration of technology in education requires not only infrastructure but also adequate time for

teachers to familiarize themselves with digital tools, redesign lesson plans, and adapt pedagogical strategies. When teachers are overburdened or rushed, they are less likely to experiment with or adopt new methods, even if resources are available.

The emphasis on time constraints also highlights the need for institutional support in the form of time allocation for ICT training, collaborative planning, and continuous professional development. Without this support, technology risks becoming an underutilized asset.

In conclusion, while investment in infrastructure is essential, school leadership and education policymakers must also consider the time and workload pressures teachers face. Addressing these human resource constraints is critical to ensuring that available technologies are effectively incorporated into everyday teaching and learning

(f) Technological Tools and Infrastructures Available for Educational Purpose

The utilization of modern hardware and software resources is a crucial aspect of integrating technology into educational institutions. (Dobrica *et al.,* 2023). In developed countries, the majority of schools have various technological infrastructures, and digital resources are accessible to improve instructional (Adil *et al.,* 2022). For example, schools in Australia have provided personal notebook computers and have established web spaces, email access, and work spaces for all staff and students from Year 5 onwards (Timotheou *et al.,* 2023). Video conferencing was also available, and the school developed its intranet, which housed all its resources online and could be accessed via radio connections from both school and home. Using an observation checklist, the researcher aimed to determine the availability of teaching and learning equipment and essential ICT facilities in Tigania West Sub-County secondary schools. **Table 4.7**outlines the findings.

Table 4.7

Technological Tools and Infrastructures Available for Educational Purposes

Equipment/facilities	Available		Not available	
	F	%	F	%
Internet connectivity	13	86.7	2	13.3
Laptops	15	100	0	0
Projectors	7	46.7	8	53.3
Storage devices	15	100	0	0
Desktop computers	13	86.7	2	13.3
Simulation software	5	33.3	10	66.7
Scanners	10	66.7	5	33.3
digital cameras	1	6.7	14	93.3
TVs	12	80	3	20
Newspapers	15	100	0	0
Journals	6	40	9	60
Whiteboards	14	93.3	1	6.7
Anti-virus software	15	100	0	0
Connection cables	15	100	0	0
Technicians	5	33.3	10	66.7
Computer laboratories	7	46.7	8	53.3
Fans	15	100	0	0

The findings from the observation schedule, as summarized in Table 4.7, indicate that most public secondary schools in Tigania West Sub-County are equipped with basic technological tools and infrastructure to support teaching and learning. High availability was recorded for laptops (100%), storage devices (100%), antivirus software (100%), connection cables (100%), and newspapers (100%), while desktop computers (86.7%), internet connectivity (86.7%), and whiteboards (93.3%) were also widely accessible.

These findings suggest a significant investment in core digital infrastructure and resources, which can enable teachers to incorporate technology into instructional delivery more effectively. According to Hanaysha *et al.* (2023), the presence of fundamental technological tools such as computers and internet access is crucial for promoting digital literacy and facilitating interactive, student-centered learning experiences.

However, despite the overall availability of essential infrastructure, the findings also reveal critical gaps. Notably, 66.7% of schools lacked simulation software a key tool for subjects that benefit from visual or practical demonstrations, such as science and mathematics. Additionally, 66.7% of schools had no ICT technicians, which may hinder timely maintenance and troubleshooting of devices, thereby affecting the consistent use of technology in classrooms.

Even more concerning, 93.3% of schools lacked digital cameras, limiting opportunities for interactive projects, digital documentation, and multimedia learning. Furthermore, 53.3% of schools had no access to projectors or computer laboratories, which could restrict broader technology use across subjects and limit student access to digital learning environments.

The presence of such infrastructure is not only vital for enhancing instructional quality but also contributes to preparing students for the demands of a digital economy. However, the

absence of supportive technologies and technical personnel suggests that more needs to be done to bridge the gap between basic access and effective integration. The data demonstrates that while foundational technological infrastructure exists in many schools, there is a need for further investment in advanced tools such as simulation software and projectors and technical support staff to sustain meaningful use of technology in education. To fully realize the benefits of ICT in instruction, future policies must emphasize equity, ongoing maintenance, training, and comprehensive ICT support systems.

4.4.2 Teachers attitudes towards technology

The study aimed to investigate the impact of teachers' attitudes on incorporating technology in instructional delivery. In line with this objective, the study examined twenty-five items to gauge teachers' perspectives on technology integration, and the findings are displayed in **Tables 4.8 and 4.9.**

(a) Opinions of Departmental Heads on Teachers Attitudes Towards Technology

The heads of departments were asked to rate how much they agreed with the statement about how useful, how easy to use, and how teachers felt about using technology in the classroom. The results can be seen in **Table 4.8.**

Table 4.8

Teachers Attitudes towards Technology

Statement	Mean	Standard Deviation
Perceived Usefulness		
Using technology in teaching would enhance teachers' effectiveness in delivering lessons	4.7	0.76
Integrating technology would improve students' engagement in the learning process	4.3	0.44
Technology integration would lead to better learning outcomes for students	3.4	0.83
Using technology would facilitate differentiation and personalized learning in the classroom.	4.5	0.78
Perceived ease of use		
Teachers can quickly learn how to use new digital tools for teaching.	4.1	0.81
Integrating technology into teaching requires minimal effort from teachers	2.0	0.78
Teachers feel confident in effectively integrating technology into their teaching practices.	2.0	1.21
Teachers feel that using technology will not complicate their teaching methods.	2.1	0.81

Attitudes toward technology integration		
Incorporating technology into the classroom is something that the department's teachers are enthusiastic about.	4.7	0.60
Educators are eager to learn about and experiment with new technological resources that can improve their classroom methods.	3.0	0.90
There is a culture of innovation and experimentation with technology integration among teachers in the department	2.2	1.30
Average score	**3.2**	**0.90**

According to the heads of department teachers are more likely to embrace and incorporate technology into their lessons if they think it will make them more effective, get students more involved, improve their learning outcomes, and allow for more personalized learning. Stumbrienė *et al.,* (2024) found the same thing and proposed that teachers should use technology if they think it will help their students learn and improve their teaching approaches.

Also, the heads of department agreed that instructors would be more comfortable and open to using technology in the classroom if they believed it was simple and wouldn't take up much of their time. In addition, they concluded that educational technology is more likely to be used when instructors perceive it as user-friendly and are thus more inclined to incorporate it into their lessons. This good assessment of its usage can foster a more favorable attitude toward integrating technology into the classroom (Khlaisang et al., 2023).

(b) Opinions Teachers on Their Attitudes Towards Technology

Teachers were requested to indicate their agreement with the statement regarding technology integration in instructional delivery. **Table 4.9** outlines the results.

Table 4.9

Teacher's Attitudes towards Technology

Statement	Mean	Standard Deviation
The utilization of technology can make challenging subjects more straightforward to comprehend.	5.0	0.00
Male teachers are better than female teachers in ICT	5.0	0.00
The use of technology motivates students to learn	4.9	0.13
Technological tools are challenging to use	1.6	1.11
Technology makes it easier to respond to the needs of students	4.9	0.31
Technology enables student-centered learning, with the teacher serving as the facilitator.	4.7	0.45
The use of technology makes the lesson more interactive	4.8	0.39
I encourage my students to use technological tools	4.7	0.44
Technology needs to be used by the newly graduated teacher	1.0	0.00
"The use of technology makes me a more effective teacher."	4.7	0.93
I feel comfortable using a computer	4.8	0.90
Using technological tools when teaching can help improve students' performance.	4.7	0.87
The use of technological tools in class is very frustrating	1.5	1.16
Given the opportunity, I will upgrade my ICT skills.	5.0	0.0
Average score	**4.1**	**0.49**

Most respondents (5.0 on a scale from 1 to 5) felt that technology can simplify complex subjects. This aligns with research by (Guang & Xueliang, 2025), which shows that technology is essential for increasing students' drive, interest, and involvement. Furthermore, with mean ratings of 5.0, 4.7, and 5.0, respectively, teachers indicated a desire to improve their technological abilities and thought male teachers were better at using technology than female teachers. These results contradict the study by (Oputa *et al.,* 2024) that found no gender gap in public secondary school teacher's technological tools. The results also show that teachers are open to learning new things and improving their craft with technology.

The teachers agreed with the following statements: "The use of technology makes me a more effective teacher," "The use of technology will make the lesson more interactive," "The use of technology makes learning student-centered with the teacher being the facilitator," and "The use of technology makes it easier to respond to the needs of the students," with mean scores of 4.7, 4.8, 4.7, and 4.9, respectively. It appears that teachers are receptive to incorporating technology into their lessons, but they can face challenges due to their little understanding of the subject. Furthermore, with mean scores of 1.5 and 1.6, most respondents acknowledged that technological tools can be difficult and annoying to use in the classroom. Consistent with an earlier study by (Mapisa & Makena, 2024) showing that teachers' opinions affect their readiness to include ICT in teaching and learning, it was also discovered that teacher's attitudes toward the usage of ICT influence its integration in schools.

Most respondents (mean score of 1.0) believed that any teacher could use technology to enhance the teaching-learning process, implying that recently trained teachers should not use technology in the classroom. This result contradicts what was previously shown by Kerzic *et*

al., (2021) that younger teachers use technology in the classroom more than their more senior counterparts. While many teachers are enthusiastic about incorporating ICT into the classroom, the survey found that many might lack the necessary expertise to make the most of this opportunity (Alieto *et al.*, 2024).

4.4.3 Teachers' training in ICT and its integration in teaching-learning

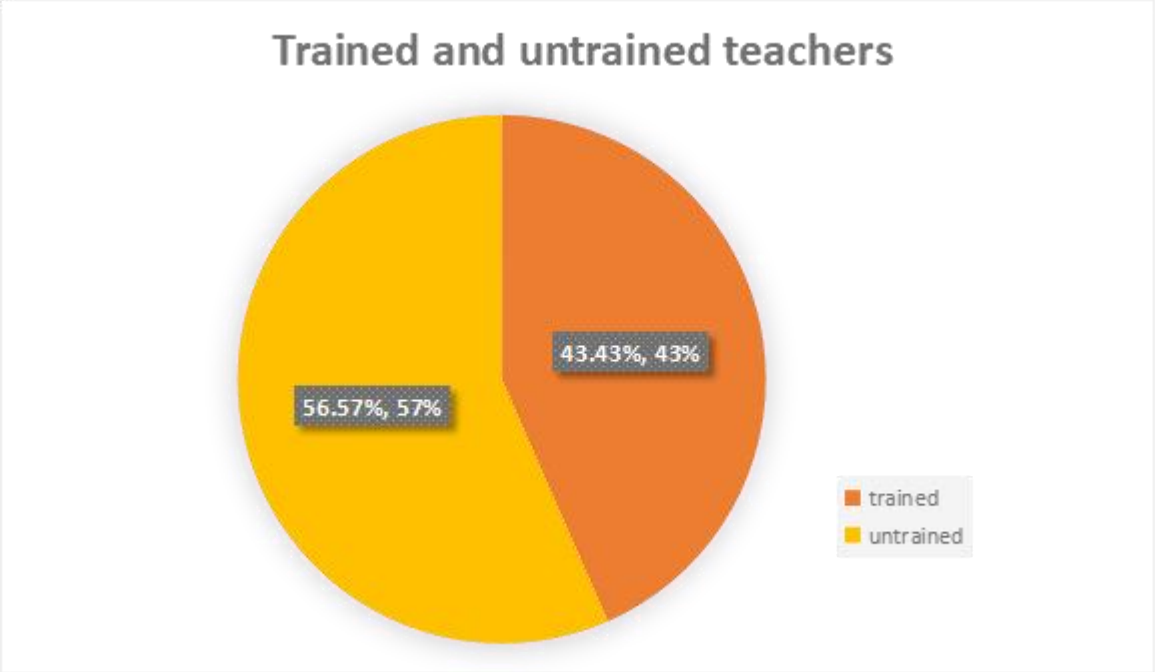
The study aimed to assess how teachers' technology training affects the incorporation of technology in teaching and learning. The study focused on four specific areas: teachers' technology training and the depth of their training, the location of the training, teachers' attendance at workshops and in-service training, and the relevance of the training to their instruction. The findings for each of these areas discussed.

(a) Trained teachers

The study found that 43.43% of the respondents were trained in basic technological skills, while the majority, 56.57%, were not trained, as shown in **Figure 5**.

Figure 5

Trained Teachers



The study's findings highlight a significant gap in teacher preparedness for technology integration. With only 43.43% of teachers having received any form of training in basic technological skills, and the remaining 56.57% lacking such training entirely, there is a clear indication that most teachers are not adequately equipped to utilize digital tools in their teaching. Even more concerning is that those who had undergone training mainly in basic computer packages still expressed that their knowledge was insufficient for effective classroom application. This suggests that the training provided is either too basic or not aligned with the actual demands of teaching with technology.

These results strongly align with Hyler *et al.* (2017), who argue that effective technology integration requires more than just basic IT knowledge; it demands specialized training that is ongoing, practical, and classroom-focused. Teachers need to understand not just how to operate devices, but how to use them to enhance learning outcomes, differentiate instruction,

and engage students. Moreover, without hands-on experience and follow-up support, even trained teachers may lack the confidence to implement what they learn.

Other recent studies support this. For instance, Darling-Hammond *et al.* (2022) emphasize that professional development should be sustained, collaborative, and linked to curriculum and student learning. Similarly, Koehler and Mishra (2022), in their work on the framework, argue that teachers need training that integrates technological, pedagogical, and content knowledge, rather than isolated ICT skills.

Thus, the study reflects a broader challenge in many educational systems: technology is available or encouraged, but teachers are not sufficiently empowered to use it meaningfully. Addressing this gap will require investment not only in training but also in mentorship, peer support, and institutional commitment to ongoing professional development tailored to the realities of the classroom.

(b) Place of Training

Most respondents received basic ICT training from different sources: 21.7% from Teachers' Training Colleges (TTC), 16.3% from their schools, 52.2% from commercial colleges, and 9.8% from universities. **Table 4.10**: Place of ICT Training

Table 4.10

Place of Training

Place		Frequency	Percent
	Commercial college	48	52.2
	School organized	15	16.3
	TTC	20	21.7
	Universities	9	9.8
Total		**92**	**100.0**

The findings of this study reveal that most teachers in Tigania West received ICT training from commercial colleges (52.2%), with significantly fewer trained through formal institutions such as Teachers' Training Colleges (21.7%) and universities (9.8%). This pattern suggests a systemic gap in pre-service teacher education, where universities and TTCs are not providing sufficient training on integrating technology into pedagogy. Instead, the training primarily focuses on basic digital literacy skills how to operate a computer or use common software rather than how to apply these tools in teaching and learning. This observation aligns with the findings of Murithi & Yoo (2021), who reported that in Kenya, most teacher training programs emphasize technical operation over pedagogical application, leading to limited capacity among teachers to use ICT meaningfully in classroom instruction. Further support comes from Barakabitze *et al.* (2022), who found that many East African secondary school teachers acquire digital skills through informal channels or private training centers, due to a lack of structured ICT integration in national teacher education programs. Similarly, Mtebe and Raphael (2022) reported in their Tanzanian study that teacher training

institutions tend to teach digital tools in isolation, failing to link them with actual classroom practices, which undermines the potential impact of technology on learning outcomes.

Globally, Tondeur *et al.* (2022) argue that effective ICT integration in education requires a shift in teacher training from tool-based instruction to pedagogically grounded training models, which helps teachers understand how to blend technology meaningfully with subject content and teaching strategies. In Kenya's context, the lack of such comprehensive frameworks in teacher preparation explains why many teachers remain underprepared despite having basic ICT knowledge.

Therefore, these findings emphasize the urgent need to reform teacher education programs to provide pedagogical training in ICT use, rather than just technological literacy. This includes embedding technology use within the curriculum of teacher education institutions, promoting mentorship and peer support, and offering continuous professional development tailored to the realities of secondary school teaching in Kenya. Without such reforms, as supported by multiple studies, technology will remain underutilized in classrooms, and its potential to enhance teaching and learning will be unrealized.

(c) Attendance of Technology Training/Workshops

Most respondents stated that technology training and workshops rarely took place, typically occurring once a year. Not all teachers attended these sessions, with 46.4% being uncertain and 53.6% confirming that teachers did participate in technology training. This aligns with Demir, (2024) who discovered that almost half of the teachers did not engage in in-service training and professional development, which poses a significant obstacle to technology integration. Additionally, Akram *et al.,* (2021) suggested that higher skills and knowledge

levels would lead to greater technology integration, resulting in positive student achievements. The detailed findings were presented in Table 4.11.

Table 4.11

Attendance of technology training workshops

		Frequency	Percentage
Valid	Yes	52	56.5
	No	26	28.3
	Not sure	14	15.2
	Total	**92**	**100.0**

The data indicates that while a majority of teachers (56.5%) reported having attended technology training workshops, a significant portion (28.3%) had not, and 15.2% were unsure. This suggests that access to professional development opportunities in ICT is unevenly distributed among teachers in public secondary schools. Respondents who had not attended such workshops cited limited support from school administration, particularly the selective nomination of participants by principals due to financial constraints. This points to systemic barriers that hinder equitable access to ICT training, which is crucial for effective technology integration in education.

These findings are consistent with Koech & Mwangi (2022), who found that in many Kenyan public secondary schools, attendance at ICT workshops was often limited to heads of departments or senior teachers due to inadequate training budgets. Consequently, many classroom teachers remained untrained and unprepared to integrate digital tools into their instruction. Similarly, Okello & Abong'o (2023) revealed that a lack of structured and

inclusive training policies led to uneven skill acquisition among teachers, often resulting in frustration and reluctance to adopt technology in classrooms.

In a broader African context, Mensah & Owusu (2022) reported that in Ghana, only 42% of public-school teachers had received ICT training in the previous two years, mainly due to inadequate funding and poor coordination between government agencies and school administrators. This aligns with the view that while national ICT policies may advocate for teacher training, implementation at the school level often faces practical challenges such as insufficient funding, poor planning, and lack of follow-up.

Moreover, UNESCO (2022) emphasized that effective professional development must be inclusive, continuous, and linked to classroom practice. One-off workshops attended by only a few teachers are unlikely to lead to meaningful change. Teachers who are excluded from training opportunities may feel marginalized and less confident in using technology, which undermines school-wide ICT integration efforts.

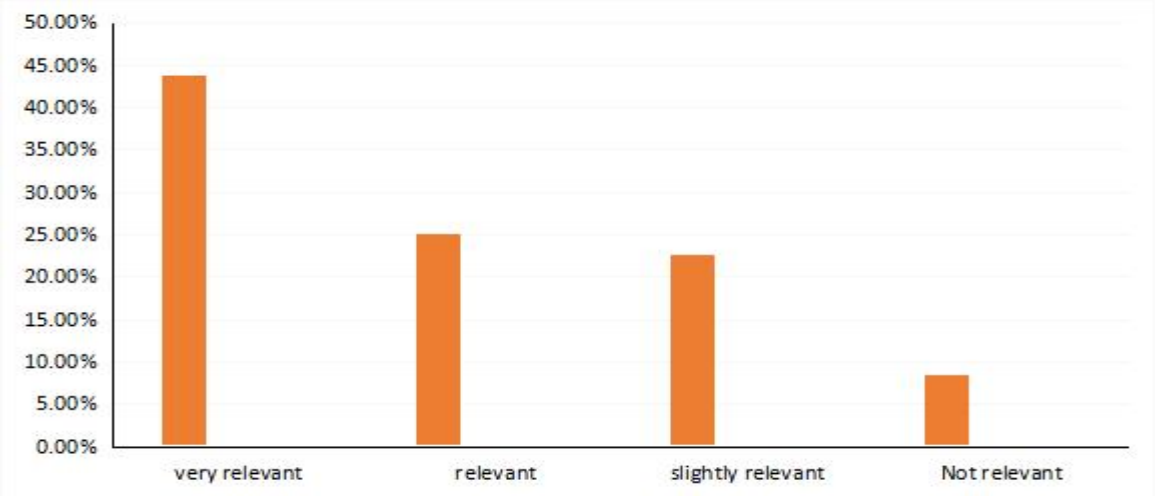
Therefore, this study's findings highlight the need for school leaders and policymakers to adopt inclusive, well-funded, and scalable ICT training programs. Ensuring that all teachers not just a select few are given regular opportunities for professional development will build collective ICT capacity, reduce disparities, and promote widespread adoption of technology in teaching and learning.

(d) Relevance of Technological Training in Education

Respondents indicated that technology training was very relevant 43.9%, relevant 25.0%, slightly relevant 22.6%, and not relevant 8.5%, as shown in **Figure 6**.

Figure 6

Relevance of Technology Training



The research findings indicate that teachers who participated in technology training and workshops found the training highly relevant for teaching. A small number of them felt that the training was slightly relevant, while an even smaller group found it irrelevant for teaching. These findings contradict an earlier study by Pappa *et al.,* (2024), which reported that most teachers who took part in technology training deemed it irrelevant to classroom teaching. The study also found that most participants stated that technology training made their teaching more effective, leading to improved student performance.

However, it was noted that in-service training on technology integration was rarely available for teachers, with only 71.4% attending technology workshops or training once a year. In comparison, 14.3% had not attended any. This lack of training indicates insufficient support for teachers to upgrade and update their ICT knowledge. The inadequacy of appropriate technological skills was identified as a barrier to integrating technology into the teaching process, which is consistent with the findings of a study by (Zenda & Dlamini, 2023b). Their research demonstrated that professional development significantly influences integrating

technology in the classroom. The respondents also emphasized that training helps improve teachers' use of technology by equipping them with the necessary skills and knowledge to utilize technology equipment in the classroom and improve their attitudes.

4.5 Qualitative Data from the Interviews

4.5.1 Availability of technology infrastructure

According to interviews, school principals who were interviewed noted that having constant access to technology tools usually comes with superior technical assistance and maintenance, ensuring that technological issues do not disrupt the teaching process (Molefi *et al.,* 2024). According to the study by (Ureta, 2024), most of the school materials the MOE provided were never maintained. The study also discovered that providing adequate access to technology tools ensures that all students and teachers have equal opportunities to use them. Teachers are more likely to use digital resources in their lessons when they are widely available (Bhaskar & Gupta, 2024). This availability also promotes professional growth and training, boosting teachers' comfort and skill with technology.

4.5.2 Teacher- Attitudes Technology Integration

According to school principals interviewed, 80% of teachers are keen on finding ways to incorporate technology into the classroom. Nevertheless, they view it as a tedious task because they are uninformed and lack the necessary abilities. Principals have expressed confidence that, with the proper preparation, teachers can successfully incorporate technology into the classroom. Consistent with these results is research by (Boonmoh *et al.,* 2021) which argued that teachers generally support incorporating technology into the classroom, but they face challenges when trying to do so due to inadequate professional development.

According to the study, teachers' fears of losing control when utilizing technology in the classroom, their inability to find the time to utilize such tools effectively, and their general aversion to technology all contributed to their resistance to using computers in the classroom. This agrees with the findings of (Wang & Zhao, 2023) who also found that teachers generally view technology in the classroom negatively.

Nevertheless, the correlation between teachers' attitudes toward technology and technology integration in the classroom was negative (Makhlouf & Bensafi,2021). The study also found that some teachers have a negative outlook on technology because they feel it does not make a significant difference in reaching educational objectives or is not necessary for their classrooms or instruction. To modify teachers' attitudes towards technology in education, school principals have proposed educating more teachers in the operation of ICT equipment, promoting the use of ICT in teaching, and conducting frequent workshops (Gonfa *et al.,* 2024).

4.5.3 Teachers' training in ICT

School principals interviewed reported that the government funds teacher training through the Ministry of Education, although it occurs rarely, usually once a year. Teachers attending in-service training often lack commitment due to financial challenges. During the training, reimbursement of transportation expenses and provision of lunch are needed, which would encourage a higher turnout.

The study found that most trained teachers only possess essential technology competencies, such as connecting cables, computer operating, file management, and internet usage. Respondents noted that the lack of advanced ICT skills affects teachers' ability to incorporate technology in their teaching. These findings by Aithal & Aithal, (2023) support

previous recommendations that stakeholders should receive training on using technological tools for teaching rather than just essential computer operations.

CHAPTER FIVE: CONCLUSION, RECOMMENDATIONS AND PUBLICATION

5.1 Introduction

The chapter summarizes the findings, conclusions, and recommendations based on the research objectives.

5.2 Summary of the Main Findings

5.2.1 Availability of technological infrastructure

According to the results, most instructors (83%) feel that their school offers computer labs for computer science classes. 80% of teachers felt that the majority of schools had computers available for classroom use. This indicates that technological resources were accessible for instructional delivery in several secondary schools. Across Tigania West Sub-County, principals felt that students could not fully benefit from integrating technology into the classroom due to a lack of suitable technological infrastructure. Inadequate technology resources relative to the number of students and teachers in each institution were vital factors. This confirms the results of a prior study by Eden *et al.,* (2024) that indicated that the ease and accessibility of technological infrastructure affect the degree to which it is integrated into the classroom.

5.2.2 Teachers attitudes towards technology

With an average score of 4.1, the results show that teacher's attitude greatly affected the incorporation of technology into the classroom. On average, heads of department gave teachers' attitudes a 3.2, indicating their belief that teachers' attitudes significantly impacted technology integration in the classroom. Most respondents favored incorporating technology into the classroom, although they were hesitant to do so because they felt unprepared. So, implementing technology into their lessons was difficult and frustrating for them.

5.2.3: Teacher's training

The study discovered that most respondents had minimal computer skills instruction at TTC. They were primarily trained in computer packages at the certificate level, and they reported that this training helped them teach more effectively. In-service training occurred infrequently, with the majority of teachers not attending the training. The study also revealed that most respondents lacked knowledge of technology.

5.3 Conclusion

The study found that Tigania West Sub-County secondary schools struggle to incorporate technology into their lessons due to a lack of infrastructure, outdated or poorly maintained hardware, restricted access, unreliable internet, and educational software.

This conclusion is consistent with the findings by Bhaskar & Gupta, (2024) that suggests that when the resources are easily accessible, teachers are more likely to use technology in the classroom.

Furthermore, the study indicates that teachers currently use technology at a low level for educational purposes. The degree to which teachers embrace technology in the classroom is positively correlated with their views on its potential benefits for students' learning. Addressing teachers' attitudes and providing them with the training they need to become more competent and confident when it comes to employing technology in the classroom is crucial.

Neither the principals nor the teachers at the secondary school level have specialized training in technology; however, they have completed certificate programs in basic computer literacy. This dearth of topic-specific technological training highlights the necessity for comprehensive training to develop the competence and self-assurance

necessary to incorporate technology into the classroom successfully. Furthermore, the training must be on how teachers may incorporate technology into their lessons rather than just teaching them how to use computers.

5.4 Recommendations from the Study

The study findings led to the following recommendations:

The MOE should organize seminars and workshops to enhance teachers understanding and appreciation of technology in education. These events would highlight the benefits of technology for improving teaching effectiveness, student engagement, and administrative efficiency.

Additionally, the MOE should address resistance from long-serving teachers by offering targeted workshops to alleviate their concerns, demonstrate technology's positive impact, and support their transition. Engaging these teachers in discussions about technology's role in modern pedagogy and providing ongoing support shift attitudes and promote effective technology integration in the classroom.

Educational institutions should ensure that all teachers receive comprehensive training in technological skills essential for integrating technology into teaching and learning. This training should cover a range of competencies, from basic digital literacy to advanced technological tools and applications relevant to their subject areas. By equipping teachers with these skills, institutions can enhance their ability to effectively use technology in the classroom, thereby improving instructional methods and student engagement.

Additionally, institutions should place a strong emphasis on integrating technology training into the curricula for teacher trainees. Encouraging future educators to acquire updated technological skills during their college years ensures they enter the profession well-

prepared to use modern educational technologies. This proactive approach will help new teachers seamlessly incorporate technology into their teaching practices from the outset of their careers, fostering an environment where technology is used effectively to enhance learning outcomes. By prioritizing technological proficiency in both current and future teachers, educational institutions can contribute to a more dynamic and technologically advanced educational landscape.

Public secondary school management should actively champion the integration of technology through self-help initiatives, taking a proactive role in implementing and supporting technological advancements in their schools. This involves establishing a supportive environment where technology is embraced as a tool to enhance teaching and learning.

School management should provide robust backing for teachers by facilitating access to necessary technological resources, offering professional development opportunities, and encouraging the use of technology in the classroom. By creating a positive and resource-rich learning environment, school management can help teachers feel confident and supported in their efforts to incorporate technology into their teaching practices.

Furthermore, schools should foster a culture that values continuous improvement and innovation, encouraging teachers to experiment with and adopt new technologies. This support might include providing technical assistance, sharing best practices, and creating collaborative opportunities for teachers to discuss and refine their use of technology. By leading these self-help initiatives and ensuring a supportive environment, school management can significantly enhance the effectiveness of technology integration and improve overall educational outcomes.

To ensure that secondary school teachers remain competent and confident in their use of technology, they must engage in regular skill enhancement and continuous professional development. This involves participating in ongoing training opportunities to stay current with evolving technological tools and applications relevant to their teaching practices.

Regular skill enhancement helps teachers adapt to new technologies and integrate them effectively into their classrooms. Continued professional development can include attending workshops, webinars, and conferences focused on educational technology, as well as pursuing certifications or advanced courses related to digital tools and instructional technologies. By actively seeking out and engaging in these learning opportunities, teachers can maintain their proficiency, implement best practices, and effectively leverage technology to improve student learning outcomes.

Ongoing training also provides teachers with the latest insights and strategies for using technology in education, enabling them to address challenges and maximize the benefits of technological innovations. This proactive approach to skill development ensures that teachers are well-prepared to meet the demands of modern education and contribute to a dynamic and technologically enriched learning environment.

5.5 Recommendation for Future Study

Future investigations should focus on evaluating the cost-effectiveness of incorporating technology into the classroom, as this aspect requires a deeper understanding of the financial implications and benefits associated with technology use in education. Research should explore how technology investments impact educational outcomes, cost savings, and overall value for schools. This will provide a clearer picture of the financial viability and potential return on investment for integrating technology.

Additionally, extending research to other sub-counties across the country can offer a broader perspective on how different regions implement and benefit from technology in education. Comparative studies can highlight regional differences, challenges, and successes, helping to identify best practices and areas for improvement.

Furthermore, focused research in specific technology areas, such as internet usage in schools, is essential. Detailed investigations into how various technological tools and resources, like internet access and digital platforms, affect teaching and learning can provide valuable insights. This research can inform policies and strategies for optimizing technology integration, addressing specific needs, and enhancing educational effectiveness.

5.6 Publication

Evaluation of Teacher Training in Integration of ICT in Teaching Public Secondary Schools in Tigania West, Meru County, Kenya; Nancy Mukiri Ngaya, Hilda Omae, Mercy Thuranira, International Journal of research and innovation in school science (IJRISS), DOI: https://dx.doi.org/10.47772/IJRISS.2024.809032

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APPENDICES

Appendix A:Questionnaire for Heads of Department

This study aims to determine the effect of teacher preparedness in incorporating technology in teaching in public secondary schools in Tigania West Sub County. Your answers and data will remain private and only be used for the educational objective of the study. To share your views, please fill in the blank spaces or put a tick (✓) in the spaces provided.

Part 1: Department Information:

Department name	
Number of years you have served as HoD	
Total number of teachers in your department	
your teaching subjects	

Part 2. Attitudes Towards Technology

Please indicate the level of agreement with the following statement on the perceived usefulness, ease of use, and instructors' attitudes toward incorporating technology into teaching and learning. Please tick (✓) your choice.

Key: SA - strongly agree, **A** - agree, **N** - neutral, **D** - disagree, **SD -** strongly disagree

Statement	SA	A	N	D	SD
Perceived Usefulness					
Using technology in teaching would enhance teachers' effectiveness in delivering lessons.					
Integrating technology would improve students' engagement in the learning process.					

Technology integration would lead to better learning outcomes for students.					
Using technology would facilitate differentiation and personalized learning in the classroom.					
ease of use					
Teachers find it easy to learn how to use new technology tools for teaching.					
Integrating technology into teaching requires minimal effort from teachers.					
Teachers feel confident in effectively integrating technology into their teaching practices.					
Teachers believe that using technology would not complicate their teaching processes.					
Attitudes toward technology integration					
Teachers in the department have positive attitudes towards integrating technology in teaching.					
Teachers are enthusiastic about exploring new technology tools to enhance their teaching practices.					
There is a culture of innovation and experimentation with technology integration among teachers in the department					

Part 4: Teacher Training and Support

9. Has your department provided training or professional development opportunities focused on technology integration? Yes [ ] No [ ]

b. If yes, how effectively have these training sessions improved teachers' attitudes towards technology?

Very ineffective [ ] Ineffective [ ] Somehow effective [ ] Effective [ ] Very effective [ ]

c. If not, do you believe providing such training would positively impact teachers' attitudes towards technology integration?

Yes [ ] No [ ]

Part 5: Resources and Infrastructure

10. What resources or technological infrastructure does your department provide to support teachers in incorporating technology into their teaching practices?

……

11. Are there any challenges or limitations related to resources that hinder teachers from effectively integrating technology?

……

Appendix B: Questionnaire for Teachers

The purpose of this research is to determine and establish whether public secondary school teachers are adequately equipped to use technology in their lessons. All your responses and information will be kept strictly confidential and only used for the educational purposes of the study. Please share your views by filling in the blank spaces or putting a tick () in the spaces provided.

Section A: Demographic Information

1. what is your gender? male[ ] female [ ]

2. what is your age bracket? Below 30 years [ ] 31 to 40 years [ ] 41 to 50 years [ ] 51 to 60 years [ ]

3. For how many years have you taught in this school?

Months……. Years……...

4. What are your highest academic qualifications?

Highest academic qualifications	
Diploma in education (without IT)	
Diploma in education (with IT)	
Bed (with computer as a teaching subject)	
Bed (without a computer as a teaching subject)	
Masters	
PhD	

Other qualifications, specify……...

5. what is your teaching work experience?

Below 5years [ ] 6 to 10 years [ ] 11 to 20 years [ ] Over 20 years[ ]

Section B: Availability of Technology Infrastructure

5. Does your school have a computer laboratory for teachers and learners?

Yes [ ] No [ ]

If yes, is it equipped with the following tools for education?

Computers [ ] smart boards [ ] laptops [ ] projectors [ ] others specify…….

6. Does the school have an internet connection? Yes [ ] No [ ]

7. Can you access education software or applications to enhance teaching and learning? Yes [ ] No [ ]

b) If yes, please specify…….

8. How frequently are the technology devices updated or replaced?

Weekly [ ] Rarely [ ] Daily [ ] Never [ ]

9. Does your school have a computer technician? Yes [ ] No [ ]

10. Does the technician respond promptly if a problem occurs with the technology infrastructure? **S**trongly agree [ ] Agree [ ] Disagree [ ]strongly disagree [ ]

11. How often do you use computers during teaching and learning in your classroom?

Weekly [ ] Rarely [ ] Daily [ ]Never [ ]

12. Is there a dedicated room/space for utilizing technology in teaching?

Yes [ ] No [ ]

Section C: Teacher Attitude Towards Technology

14. Please indicate to what extent you agree with the following statement on technology integration in teaching and learning. Please mark (√) your right choice.

Key: SA-strongly agree **A**-agree **U**-undecided **D**-disagree **SD**-strongly disagree

Statement	**SA**	**A**	**U**	**D**	**SD**
Technology can help to simplify complicated concepts.					
The use of technology encourages students to learn.					
Male teachers are more effective than female teachers in ICT.					
Technological tools are challenging to use					
Technology makes it easier to meet the demands of students.					
With technology, the focus shifts from the teacher to the student, making the teacher take on the role of facilitator.					
Lesson participation is enhanced with the incorporation of technology.					
I encourage my students to use technological tools.					
The newly graduated educators must utilize technology.					
Technology has helped me become a better educator.					
When it comes to computers, I am pretty at ease.					
Using technology tools in the classroom can help students perform better.					
The use of technological tools in class is very frustrating.					
Given an opportunity, I will do my best to improve my ICT skills.					

Section D: Teachers' Training in ICT

15. Have you been educated in information and communication technology? Sure [ ] Otherwise [ ]

b) If yes, could you please tell me where you got your training? university{}. A school-based { } T.T.C { } educational institution Educated independently

c) How advanced was your training?

16. How relevant is the training to provide you with skills in lesson planning, class delivery, and presentation using ICT technologies? Highly pertinent [ ] Important [ ] marginally pertinent Unimportant [ ]

17a). Has the training improved the quality of your lessons?

If yes, then [];no, then []; not sure, []

b) Has it led to better grades for your learners?

18a) Does your school provide in-service training for teachers on integrating ICT?

Does your school have instructors participating in information and communication technology workshops or training?

Pick one: Yes [ ] No [ ] Uncertain [ ] if no. In this case, the period is

from.....

19. Is your background in integrating technology into the classroom strong?

Possible answers: Yes, No, and Not Sure.

20a. In your opinion, will teachers' ICT abilities be enhanced through computer training?

Cancel [ ] not sure [ ]

b) In such a case, how would training make educators more prepared to use ICT?

.....

Appendix C:Interview Guide for School Principals

I am pursuing the Master of Education in Leadership and Management program at Meru University. I am researching how public secondary school teachers are prepared to use technology in the classroom. I respectfully ask for your assistance. Your privacy is of the utmost importance to us, and we promise to use the data we collect from you only for this study.

1. Gender

   Male [ ] Female [ ]

2.Where would you put yourself in terms of age? Years under 25 [ ] Years between 26 and 30 [ ] Years between 31 and 35 [ ] Years between 36 and 40 [ ] For more than four decades

3. What is your most advanced credential in your field? PGDE[ ] Ph.D.[ ] Master of Arts[ ] Bachelor of Education[ ] Simmer [others]……

4. In your role as principal, what are the total years you have spent here? From one to five years, six to ten years, eleven to fifteen years.

5. What is your take on teachers' attitudes towards using technology in the classroom?.....

6 What, in your view, would prevent educators from using technological resources in the classroom? ……

7. In a nutshell, how would you describe the perspectives of your school's educators on the use of technology? …….

8. How often is teacher professional development held?.....

9. Suggest ways to improve educators' participation in in-service training……..

10. Who pays for the teachers' training?.....

11. How do we choose which educators to provide training to?.....

12. In your own opinion what are the key factors that contribute to teacher preparedness to integrate technology effectively?.....

13. How do you assess the current level of teacher preparedness for integrating technology in your school? .....

14. What support mechanisms or resources are teachers providing to enhance their preparedness to integrate technology? ……

15. How do you ensure that educators constantly learn new ways to incorporate technology into their lessons?.....

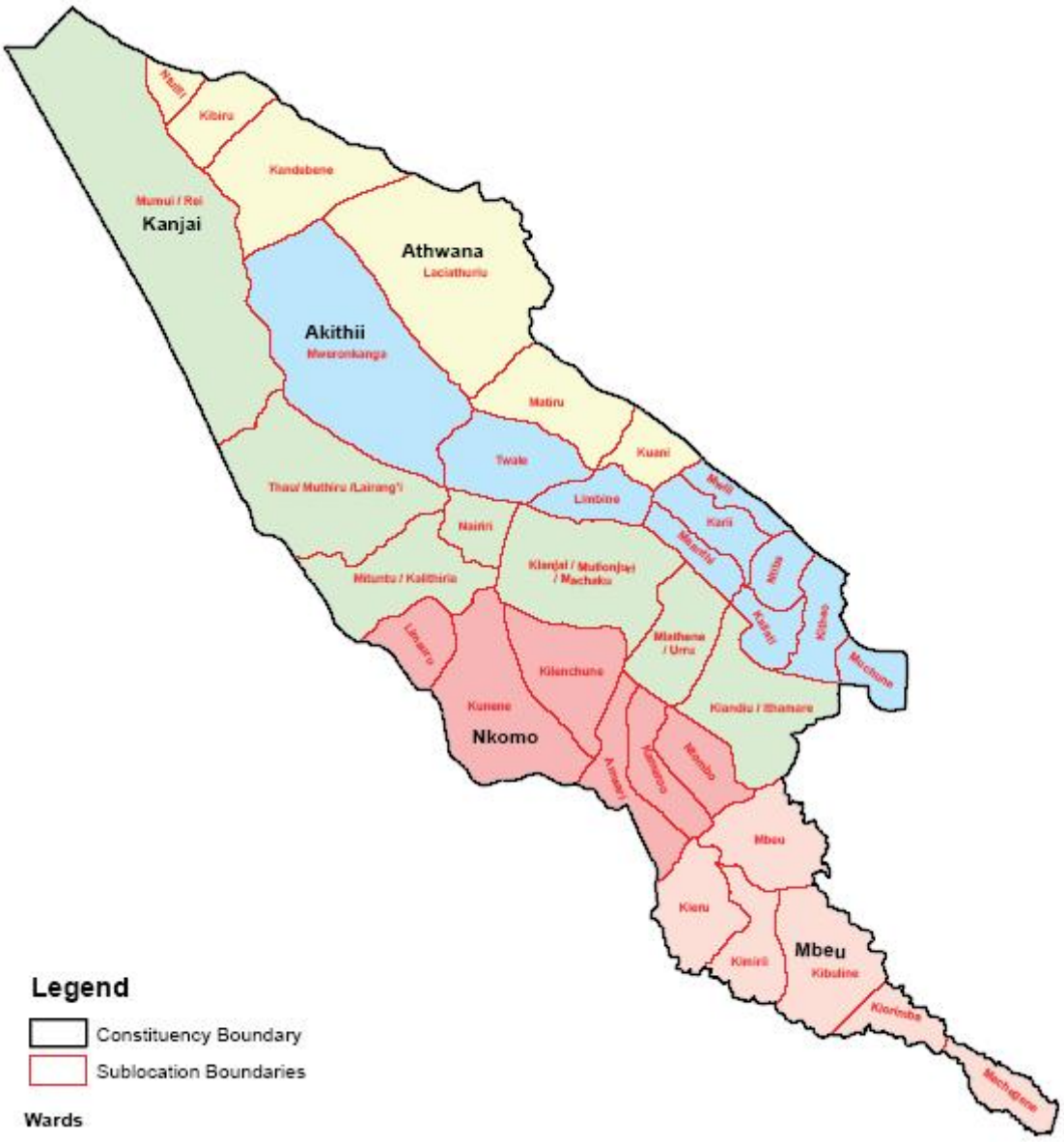
16. Can you share any success stories or best practices of teachers who have effectively integrated technology into their teaching?.....

17. What strategies do you employ to foster a culture of innovation and experiments with technology among teaching staff?.....

Appendix D:Observation Schedule

Equipment	Accessible	Not accessible	Comments
Internet connectivity			
Laptops			
Projectors			
Devices for storage			
Desktop computers			
Simulation software			
Scanners			
digital cameras			
TVs			
Newspapers			
Journals			
Whiteboards			
Anti-virus software			
Connection cables			
Technicians			
Computer laboratories			
Fans			

Appendix E:Tigania West Sub County map



Appendix F:Research Permit

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **846380**

Date of Issue: **23/May/2024**

RESEARCH LICENSE

This is to Certify that Miss.. Nancy Ngaya Mukiri of Meru University of Science and Technology, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Meru on the topic: Evaluation on teacher preparedness in integrating technology in teaching public secondary school in Tigania West Sub County,Meru county for the period ending : 23/May/2025.

License No: **NACOSTI/P/24/35751**

846380

Applicant Identification Number

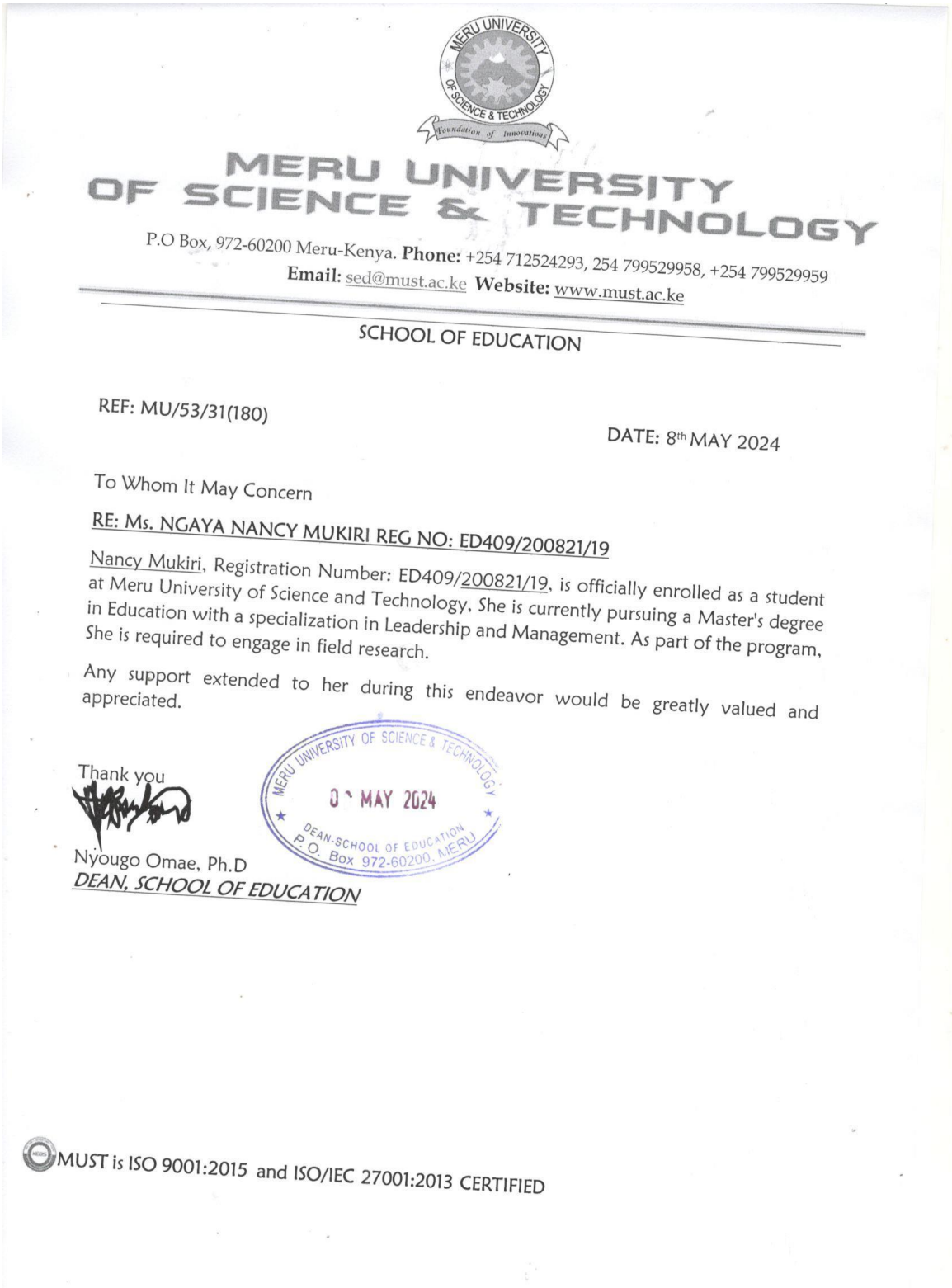
Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.

See overleaf for conditions

Appendix G:Introduction letter



MERU UNIVERSITY OF SCIENCE & TECHNOLOGY

P.O Box, 972-60200 Meru-Kenya. **Phone:** +254 712524293, 254 799529958, +254 799529959
Email: sed@must.ac.ke **Website:** www.must.ac.ke

SCHOOL OF EDUCATION

REF: MU/53/31(180)

DATE: 8th MAY 2024

To Whom It May Concern

RE: Ms. NGAYA NANCY MUKIRI REG NO: ED409/200821/19

Nancy Mukiri, Registration Number: ED409/200821/19, is officially enrolled as a student at Meru University of Science and Technology, She is currently pursuing a Master's degree in Education with a specialization in Leadership and Management. As part of the program, She is required to engage in field research.

Any support extended to her during this endeavor would be greatly valued and appreciated.

Thank you

MERU UNIVERSITY OF SCIENCE & TECHNOLOGY
0 MAY 2024
DEAN-SCHOOL OF EDUCATION
P.O. Box 972-60200, MERU

Nyougo Omae, Ph.D
DEAN, SCHOOL OF EDUCATION

MUST is ISO 9001:2015 and ISO/IEC 27001:2013 CERTIFIED

Appendix H:Tigania Sub County Education

REPUBLIC OF KENYA
MINISTRY OF EDUCATION
STATE DEPARTMENT OF BASIC EDUCATION

Telephone: 020 2069 567
Fax:

When replying please quote
E-mail:deotiganiawest@gmail.com

SUB COUNTY EDUCATION OFFICE
TIGANIA WEST
P O BOX 143– 60602
KIANJAI

RE: TIG/ED/RES/VOL.I

28TH MAY, 2024

PRINCIPALS
TIGANIA WEST

RE:RESEARCH AUTHORIZATION

In reference to License no. NACOSTI/P/24/35751. The bearer of this letter, Miss Nancy Ngaya Mukiri of Meru University of Science and Technology, has authority to conduct research in selected secondary schools in Tigania west subcounty for her Masters Thesis on the Topic:
Evaluation on Teachers Preparedness in Integrating in Teaching Public Secondary School in Tigania West Subcounty, Meru County.

The research period will end on 23/5/2025.

Accord her the assistance needed.

SUB COUNTY DIRECTOR OF EDUCATION TIGANIA WEST SUB COUNTY 29 MAY 2024 MERU P.O. Box 143 - 60602, KIANJAI

ANNASTASIA W. NJORI
SUBCOUNTY DIRECTOR OF EDUCATION
TIGANIA WEST

Appendix I:Publication

INTERNATIONAL JOURNAL OF RESEARCH AND INNOVATION IN SOCIAL SCIENCE (IJRISS)
ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume VIII Issue IX September 2024

Evaluation of Teacher Training in Integration of ICT in Teaching Public Secondary Schools in Tigania West, Meru County, Kenya

Nancy Mukiri Ngaya, Hilda Omae, Mercy Thuranira

Department of Education Science, Meru University of Science & Technology, P.O Box 972-60200, Meru

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ABSTRACT

Kenya has experienced significant growth in the incorporation of ICT into secondary school curricula in recent years. The Kenyan government has implemented numerous initiatives to enhance this. Information and Communication Technology integration in secondary school teaching and learning environments remains incomplete due to several factors. These include inadequate infrastructure, limited teacher training, resistance to change, and insufficient government policies supporting ICT implementation. Additionally, financial constraints prevent schools from acquiring the necessary technologies, and there is often a lack of ongoing technical support. Despite the growing recognition of ICT's importance in enhancing learning outcomes, these challenges hinder its full adoption, leaving many schools without effective digital learning environments. Several experts contend that the mere installation of technical equipment and infrastructure would not inherently result in the incorporation of ICT in schools unless the teachers receive proper training on how to utilize the technologies. This study aimed to investigate the impact of teacher training on the incorporation of ICT in the instruction of public secondary schools. The study utilized a descriptive survey approach. The sample consisted of 50 public secondary schools, 50 principals, 100 heads of departments, and 200 teachers. The study utilized a stratified random sampling technique to choose schools. The purposive sampling technique was employed to assess school principals, heads of departments, and teachers. The study included a total of 105 participants, consisting of 15 administrators, 30 heads of department, and 60 teachers. Data gathering involved the utilization of questionnaires, interview schedules, and observation checklists. The quantitative data was analyzed using statistical methods such as calculating means, frequencies, and percentages. The interviews yielded qualitative data, which was evaluated using content analysis. The study determined that the training of teachers in ICT had a beneficial and substantial impact on its incorporation into the educational process. The study proposes that it is essential for all instructors to receive specialized training on the utilization of ICT in their teaching practices. One way to accomplish this is by implementing a teacher training curriculum that includes specific content on ICT pedagogy. The Ministry of Education should offer professional development programs in information and communication technology for teachers, as this will enable them to acquire ICT skills. Additional research is required to determine the level of preparedness of secondary school teacher trainers in equipping secondary school teachers with ICT skills. Incorporating integration into the process of teaching and learning.

Keywords: Teacher training, Integration of Technology, Teaching

BACKGROUND

Integrating technology into teaching practices is increasingly vital in secondary education, driven by the digitalization of society and the evolving demands of the 21st-century workforce. Successful technology integration, however, goes beyond merely providing access to digital devices. A crucial aspect of this integration is the preparedness and proficiency of educators. Research highlights that teacher training programs designed to enhance technological competence are essential to bridging this gap (González-Pérez & Ramírez-

Appendix J:Plagiarism Report

DrillBit

The Report is Generated by DrillBit Plagiarism Detection Software

Submission Information

Author Name	NGAYA NANCY MUKIRI
Title	EVALUATION OF TEACHER PREPAREDNESS TO INTEGRATE TECHNOLOGY INTO TEACHING PUBLIC SECONDARY SCHOOLS IN TIGANIA WEST, MERU COUNTY
Paper/Submission ID	2233144
Submitted by	mmusungu@must.ac.ke
Submission Date	2024-08-15 15:40:40
Total Pages, Total Words	74, 15681
Document type	Thesis

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