INFLUENCE OF INFORMATION AND COMMMUNICATION TECHNOLOGY INTEGRATION ON LEARNERS' ACADEMIC PERFORMANCE IN PUBLIC PRIMARY SCHOOLS IN KYUSO SUB-COUNTY, KITUI COUNTY KENYA

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DECLARATION AND APPROVAL

Declaration by candidate

This research project is my original work and has not been presented for a degree in any University or for any other award.

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Approval by Supervisor

I confirm that the work reported in this research project was carried out by the candidate under my supervision.

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DEDICATION

This work is dedicated to my beloved family, whose unwavering support and encouragement have been my steadfast foundation throughout this journey. To my parents, thank you for instilling in me the values of perseverance, integrity, and hard work that have guided me along the way. To my siblings, your love, laughter, and inspiration have been a constant source of motivation. This accomplishment would not have been possible without your boundless support and belief in me.

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ABSTRACT

The integration of Information and Communication Technology (ICT) in education has been widely recognized as a key factor in improving learning quality and student academic performance. However, in rural areas such as Kyuso Sub-County, Kenya, ICT integration faced challenges, including limited infrastructure and resources, which affected its effectiveness in primary education. This study assessed the influence of ICT integration on learners' academic performance in public primary schools in Kyuso Sub-County, focusing on four areas: lesson preparation, classroom teaching, revisions and private study, and examinations. The study employed a descriptive research design and used a mixed-methods approach to collect both quantitative and qualitative data. A total of 200 teachers and 400 students were sampled using stratified random and purposive sampling. Out of these, 195 teacher questionnaires (97.5% response rate) and 379 student questionnaires (94.75% response rate) were completed and returned. Data collection involved structured questionnaires for teachers and students and semi-structured interviews with school administrators. Descriptive statistics and thematic analysis were used to analyze the data. The findings revealed that ICT integration in lesson preparation improved content organization and student engagement, with 65% of students agreeing that ICT-supported lessons enhanced their understanding. In classroom teaching, 67% of students reported increased motivation and focus when digital tools were used. ICT use in revisions and private studies was found to be beneficial, with 63% of students stating that digital resources helped them study at their own pace and retain information better. Additionally, 66% of students found ICT-based examinations more comfortable and effective, while teachers observed improved assessment efficiency and timely feedback. The study concluded that ICT integration positively influenced academic performance by enhancing lesson delivery, classroom participation, self-study effectiveness, and exam preparation. However, challenges such as inadequate ICT resources and insufficient teacher training limited its full potential. The study recommended increased investment in ICT infrastructure, regular teacher training, and the provision of digital learning resources to support student engagement. Schools were encouraged to adopt ICT-based assessments and enhance digital literacy among both teachers and students. Policymakers were urged to develop ICT-friendly policies to bridge the digital divide in rural education.

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CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Globally, the integration of Information and Communication Technology (ICT) in education is seen as a pivotal factor in enhancing learning quality and student performance. ICT has expanded educational access, enabling diverse learning modes that cater to different learner needs (Fahim & Abdelhamid, 2020). Studies indicate that ICT tools can improve students' engagement and learning efficiency, contributing positively to academic outcomes (Zou et al., 2021). For instance, Fahim and Abdelhamid (2020) note that digital learning platforms facilitate the sharing of resources and interaction between students and instructors, which supports personalized learning and deeper content understanding.

However, the integration of ICT in education globally is met with challenges such as the high cost of digital tools, inadequate infrastructure, and the need for substantial teacher training (Zou et al., 2021). Even as ICT tools offer potential benefits, World Bank research highlights that the digital divide, characterized by disparities in ICT access across different socio-economic contexts, affects the consistency of academic improvements (World Bank, 2022). Although some high-income countries have embraced ICT with significant outcomes, low-resource areas struggle to achieve similar gains due to technological and economic limitations (UNESCO, 2023).

Given these challenges, the global discourse emphasizes the importance of understanding ICT's specific impacts on academic performance within varied contexts. This study contributes to this discourse by focusing on primary education in a rural Kenyan context,

where limited ICT resources pose unique barriers to achieving academic improvements through digital integration.

In Africa, ICT in education is rapidly expanding, with governments and international agencies aiming to bridge educational disparities and improve learning outcomes through digital resources (Gachau & Mukulu, 2022). ICT integration has been shown to support active learning, particularly in underserved areas, where it addresses limitations in physical learning materials (Ndiaye et al., 2020). According to Ndiaye et al. (2020), digital tools enhance students' cognitive engagement and performance, especially in critical subjects like mathematics and sciences, by enabling interactive and accessible learning resources.

Despite progress, challenges such as insufficient infrastructure, lack of digital literacy, and inadequate teacher training persist across Africa (Odongo & Wangui, 2021). For example, research in Ghana and Nigeria reveals that while ICT tools are available in some schools, their educational impact remains limited due to insufficient training of teachers and a lack of technical support (Odongo & Wangui, 2021). Further, studies indicate that the influence of ICT on learners' academic performance can vary, with significant gains observed in urban schools but minimal impact in rural settings where access is often restricted (UNESCO, 2022).

Thus, while ICT holds promise for transforming African education, the impact on academic performance is still largely context-dependent. This study, by focusing on a rural Kenyan sub-county, seeks to add valuable insights to the African narrative by examining how limited ICT resources influence academic outcomes and what factors might support improved implementation in similar regions.

Within East Africa, ICT integration in education is increasingly promoted as a tool for enhancing academic achievement and preparing students for a digitalized future (Kaburu et al., 2023). Countries such as Kenya, Uganda, and Tanzania have made concerted efforts to integrate digital learning in primary schools, particularly under national programs aimed at increasing digital literacy and student engagement (EAC, 2022). According to a study by Kaburu et al. (2023), the use of ICT in classrooms enhances learning in subjects that traditionally face high dropout rates, such as mathematics and sciences, by making content more accessible and interactive.

Yet, the digital divide remains prominent within the region, especially between urban and rural schools (Muli & Musau, 2021). Muli and Musau (2021) found that in Tanzanian and Ugandan rural schools, poor infrastructure and lack of trained teachers are major barriers to effective ICT integration. Additionally, research from the East African Educational Forum (2023) indicates that while teachers and students often express positive attitudes toward ICT, limited access and inconsistent power supply reduce the efficacy of these tools, ultimately affecting academic performance inconsistently across the region.

These studies underscore the need for a nuanced understanding of ICT's impact on academic performance within East Africa. This research will explore this impact within a rural Kenyan context, aiming to uncover the specific challenges and potential pathways for ICT use to improve learning outcomes in resource-constrained settings like Kyuso Sub-County.

Kenya has made strides in ICT integration in education through initiatives such as the Digital Literacy Programme (DLP), which distributes digital devices to primary schools nationwide (Ouma et al., 2020). Research by Ouma et al. (2020) indicates that ICT tools have improved

student engagement and understanding, particularly in subjects requiring visual aids. These devices have reportedly contributed to better academic performance by enabling students to access diverse learning materials and participate in interactive learning processes, which supports long-term knowledge retention (Kigotho & Wanjohi, 2021).

Nevertheless, ICT implementation faces significant hurdles, especially in rural areas where access to digital tools and infrastructure remains limited (Kigotho & Wanjohi, 2021). According to research by the Kenya Institute of Curriculum Development (KICD) (2022), rural schools encounter challenges such as insufficient teacher training in ICT, sporadic power supply, and inadequate funding, which hinder ICT's potential to impact academic performance. KICD (2022) notes that without addressing these barriers, ICT's effectiveness in rural education settings may remain constrained. Given these insights, it is evident that there is a need for context-specific research into ICT's role in education in Kenya. This study focuses on Kyuso Sub-County, a rural region where ICT implementation faces unique challenges, to assess its influence on learners' academic performance and identify factors that could enhance ICT's impact in similar environments.

Kyuso Sub-County in Kitui County represents a predominantly rural context where schools face resource limitations that impact the quality of education. With limited ICT infrastructure, primary schools in Kyuso struggle to achieve the same levels of ICT integration seen in urban areas (County Government of Kitui, 2021). A study by Nyamai (2022) highlights that only a fraction of Kyuso's schools have access to digital devices, with most relying on traditional teaching methods. This limited access restricts students' exposure to interactive and resource-rich digital learning experiences, which could otherwise improve academic performance.

Compounding these issues, rural schools in Kyuso often lack teachers trained in ICT, which reduces the efficacy of any available digital tools (Mwaniki, 2023). Nyamai (2022) argues that without skilled personnel, even basic ICT resources are underutilized, minimizing their impact on learning outcomes. Consequently, understanding how ICT affects academic performance in this rural context is critical for identifying tailored solutions that can address specific educational needs in Kyuso and similar areas. By focusing on Kyuso Sub-County, this study aims to provide insights into how ICT integration influences academic performance in rural primary schools, thereby informing policy and strategy development for effective ICT use in similar regions across Kenya.

1.2 Statement of the Problem

The integration of Information and Communication Technology (ICT) in primary education has been globally recognized for its potential to improve learning outcomes, yet its implementation and impact vary widely, particularly in rural contexts. In Kenya, despite significant government initiatives, such as the Digital Literacy Programme (DLP) launched in 2016 to equip primary schools with digital devices, the full potential of ICT integration has yet to be realized in many rural areas (Ouma et al., 2020). Data from the Kenya Institute of Curriculum Development (KICD) (2022) reveals that while urban schools have integrated ICT into their classrooms with notable improvements in academic performance, rural schools—particularly those in regions like Kyuso Sub-County—struggle due to inadequate digital infrastructure, limited teacher training, and sporadic internet connectivity. This disparity raises concerns about unequal access to quality education and places students in rural areas at a disadvantage in terms of academic achievement.

In Kyuso Sub-County, Kitui County, the lack of ICT infrastructure and resources is particularly pronounced, impacting students' ability to engage in effective learning and hindering academic performance. Recent local studies indicate that only 15% of schools in Kyuso have functioning ICT equipment, and an even smaller percentage has access to reliable internet (Nyamai, 2022). Additionally, many teachers lack sufficient training in ICT, limiting their ability to incorporate digital tools into their teaching practices effectively (Mwaniki, 2023). As a result, students in these schools face challenges in accessing interactive and resource-rich digital learning experiences that are proven to enhance understanding and retention. This issue is further reflected in the average performance of students in national exams, where rural schools in Kitui County, including Kyuso, consistently score lower compared to urban counterparts (County Government of Kitui, 2021).

While existing research has explored the role of ICT in enhancing academic performance in urban schools, there remains a significant gap in understanding how ICT integration—or the lack thereof—affects learning outcomes in rural Kenyan contexts. This study aimed to address this gap by examining the influence of ICT on learners' academic performance specifically in Kyuso Sub-County. By identifying the challenges and opportunities unique to this rural setting, the research provided insights into how ICT could be effectively integrated into resource-limited primary schools, contributing valuable knowledge to policymakers and stakeholders working to bridge educational disparities across Kenya.

1.3 Purpose of the Study

The purpose of this study was to investigate the influence of Information and Communication Technology (ICT) integration on learners' academic performance in public primary schools in Kyuso Sub-County, Kenya.

1.4 Objectives of the Study

i. To determine the influence of ICT integration in lesson preparation on academic performance in public primary schools in Kyuso Sub-County, Kenya.

ii. To assess the influence of ICT integration in classroom teaching on academic performance in public primary schools in Kyuso Sub-County, Kenya.

iii. To establish the influence of ICT integration in examinations on academic performance in public primary schools in Kyuso Sub-County, Kenya.

iv. To evaluate the influence of ICT integration in revisions and private studies on academic performance in public primary schools in Kyuso Sub-County, Kenya.

1.5 Research Questions

i. How does ICT integration in lesson preparation influence academic performance in public primary schools in Kyuso Sub-County, Kenya?

ii. How does ICT integration in classroom teaching affect academic performance in public primary schools in Kyuso Sub-County, Kenya?

iii. What is the influence of ICT integration in examinations on academic performance in public primary schools in Kyuso Sub-County, Kenya?

iv. How does ICT integration in revisions and private studies impact academic performance in public primary schools in Kyuso Sub-County, Kenya?

1.6 Significance of the Study

This study is significant as it sought to provide insights into how ICT integration can enhance academic performance in rural primary schools, specifically within Kyuso Sub-County. Given the ongoing efforts by the Kenyan government to implement ICT in education through programs like the Digital Literacy Programme, understanding its impact in underserved areas

is critical. By focusing on various aspects of ICT integration—such as lesson preparation, classroom teaching, examinations, and private study—this research offers a detailed view of how digital tools can support learning outcomes in rural settings where resources and infrastructure are limited. The findings would be valuable for educators and policymakers in designing effective, context-sensitive ICT strategies to improve educational quality and equity in rural regions.

Moreover, this study would benefit school administrators and teachers by identifying practical ways to utilize ICT tools within their specific constraints. Insights into the effectiveness of ICT in lesson planning, student engagement, and performance assessment could help educators make informed decisions about adopting digital resources that best serve their students' needs. For researchers, the study would add to the body of knowledge on ICT in education, highlighting the unique challenges and opportunities in rural areas. By addressing these gaps, the study aimed to contribute to the larger goal of achieving inclusive and equitable quality education across Kenya, ensuring that students in Kyuso and similar regions can access the same educational advantages as those in urban centers.

1.7 Scope of the Study

The scope of this study encompassed three main areas: geographical, content, and temporal. Geographically, the study focused on public primary schools in Kyuso Sub-County, Kenya. Kyuso was chosen due to its predominantly rural setting, which faces unique challenges in ICT access and infrastructure compared to urban regions. The study gathered data from several public primary schools within this sub-county to provide a representative view of ICT integration’s impact on academic performance in similar rural contexts.

In terms of content, the study focused on four specific objectives: the influence of ICT integration on lesson preparation, classroom teaching, examination processes, and students' revisions and private studies. Each objective addressed a critical aspect of the educational process, allowing for a comprehensive understanding of how ICT impacts various stages of learning and assessment. Temporally, the study was conducted from November 2024 to August 2025, covering the entire academic year. This timeframe allowed for the collection of sufficient data across multiple school terms, providing a robust dataset to analyze ICT's impact on academic performance over time.

1.8 Limitations of the Study

This study encountered several limitations that could have affected the depth and breadth of its findings. Firstly, disparities in ICT infrastructure and resource availability among the sampled schools in Kyuso Sub-County posed a potential threat to data uniformity. While some schools had access to basic ICT tools, others operated with minimal or no digital infrastructure, which may have influenced how ICT integration was experienced and reported. To mitigate this, stratified sampling was employed to ensure balanced representation across varying levels of ICT availability, allowing for a more equitable comparison of responses.

Secondly, the reliance on self-reported data from both teachers and students introduced the possibility of social desirability bias, where respondents might have overstated their engagement with ICT tools. To address this, the study incorporated data triangulation by supplementing questionnaire data with semi-structured interviews from school administrators. This approach enhanced the validity of the findings by capturing more nuanced perspectives and cross-verifying reported practices with actual administrative observations.

Lastly, environmental and systemic constraints such as inconsistent electricity supply and internet connectivity intermittently disrupted ICT use during the study period. These factors, common in rural settings, posed practical challenges to ICT integration in teaching and learning. To mitigate their impact on data reliability, the study considered these contextual limitations during data interpretation and included them in the thematic analysis. This ensured that the findings remained grounded in the realities of the local education environment, thereby enhancing the credibility and applicability of the conclusions drawn.

1.9 Delimitations of the Study

This study was intentionally focused on public primary schools within Kyuso Sub-County, Kenya, specifically examining the effects of ICT integration on academic performance in a rural setting. By narrowing the scope to this specific geographical area, the study aimed to address challenges unique to rural schools, such as limited infrastructure and resource constraints. This focus enabled a deeper understanding of how ICT tools can be optimized in resource-limited contexts, making the findings highly relevant for similar rural regions within Kenya. Additionally, the study limited its scope to public schools, where ICT policies and infrastructure are typically influenced by government initiatives, providing a more standardized context for assessing ICT integration's impact on learning outcomes.

The study also delimited itself to four specific aspects of ICT integration: lesson preparation, classroom teaching, examinations, and revisions or private study. These areas were chosen because they represent critical stages in the teaching and learning process where ICT tools could potentially impact academic performance. By focusing on these specific areas, the study avoids a broad, generalized assessment of ICT in education, instead allowing for detailed analysis of targeted aspects that directly influence learning outcomes. This approach provided

practical, actionable insights for educators and policymakers on where ICT resources and training can be most effectively applied to improve academic performance in rural primary schools.

1.10 Assumptions of the Study

This study operated under several key assumptions regarding ICT integration in public primary schools in Kyuso Sub-County. First, it assumed that ICT resources, where available, are accessible to both teachers and students and are actively used within the classroom setting. This includes the assumption that digital devices, internet connectivity, and educational software, if present, are utilized effectively to support lesson preparation, teaching, and student revisions. The study further assumed that teachers have received at least some foundational training in ICT use, which enabled them to incorporate these tools into their instructional practices, thereby impacting academic performance.

Additionally, the study assumed that respondents—both teachers and students—would provide honest and accurate responses during data collection. This assumption was crucial, as much of the study relied on self-reported data on ICT usage, perceptions, and its impact on learning. Furthermore, it was assumed that external factors such as electricity and internet stability would not significantly disrupt ICT use in schools throughout the study period, allowing for consistent use of digital tools. These assumptions were fundamental to evaluating the influence of ICT on academic performance, as they set a baseline expectation for the availability and effective use of ICT resources within the learning environment.

1.11 Operational Definition of Key Terms

ICT Integration: In this study, ICT integration refers to the incorporation of digital tools, such as computers, tablets, projectors, and internet resources, into various educational activities, including lesson preparation, classroom teaching, examinations, and private study or revision. It encompasses the frequency, effectiveness, and scope of ICT use by both teachers and students within the school environment.

Academic Performance: Academic performance is defined as the level of achievement of students in their school assessments, including class assignments, tests, and national examinations. It is measured by grades, scores, or pass rates in key subjects and reflects the effectiveness of teaching and learning practices, including the influence of ICT usage on learning outcomes.

Lesson Preparation: For the purpose of this study, lesson preparation refers to the activities teachers engage in before classroom instruction, including planning, resource gathering, and organizing teaching materials. ICT integration in lesson preparation includes using digital tools to access content, create lesson plans, and prepare instructional materials aimed at enhancing student understanding.

Classroom Teaching: Classroom teaching is the process of delivering instructional content to students during scheduled class time. ICT integration in classroom teaching involves the use of digital tools to facilitate lessons, encourage interactive learning, and engage students. This study assesses how the use of ICT in teaching impacts students' engagement and understanding of the subject matter.

Examinations: Examinations are formal assessments administered to evaluate students' knowledge and understanding of the curriculum. In this study, ICT integration in examinations includes the use of digital platforms or tools to prepare, administer, or evaluate tests. The term encompasses any digital means used to enhance the assessment process and its potential effects on students' performance.

Revisions and Private Study: Revisions and private study refer to the independent learning activities that students engage in outside of regular class time to reinforce their knowledge. ICT integration in revisions includes the use of digital resources, such as online tutorials, educational apps, and e-books, which support students' independent study and preparation for assessments. This study explores how access to ICT resources during private study affects academic performance.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviewed the influence of ICT integration on academic performance in public primary schools, focusing on lesson preparation, classroom teaching, revisions and private studies, and examinations. Drawing on global, African, East African, and Kenyan studies, this review explored how ICT enhances educational quality by improving teaching effectiveness, student engagement, self-directed learning, and assessment processes. Following the empirical literature (Section 2.2), the theoretical framework (Section 2.3) introduced the Diffusion of Innovation Theory and Constructivist Learning Theory to explain ICT adoption and its impact on educational equity. The conceptual framework (Section 2.4) visualized these relationships, while Sections 2.5 and 2.6 provide a summary of findings and identify gaps, particularly in rural settings like Kyuso Sub-County, Kenya.

2.2 Empirical Literature

This section systematically reviewed empirical studies relevant to each objective of the study, covering the effects of ICT on lesson preparation (Section 2.2.1), classroom teaching (Section 2.2.2), revisions and private studies (Section 2.2.3), and examinations (Section 2.2.4). The review showed that ICT integration enhances teaching quality, student engagement, and academic outcomes by supporting organized lessons, interactive classrooms, independent learning, and efficient assessment methods. However, research gaps remain, especially regarding the role of ICT in rural, resource-limited schools.

2.2.1 Influence of ICT Integration in Lesson Preparation on Academic Performance in Public Primary Schools

Globally, the integration of ICT into lesson preparation has been linked to enhanced teaching effectiveness and learner performance. Wang et al. (2020), in their study in China, demonstrated a 25% rise in student engagement and a 15% improvement in test scores when teachers integrated digital tools during lesson planning. These findings underscore the growing role of ICT in transforming passive teaching into active, engaging instruction. However, the study's urban-based sample may limit generalisability to rural contexts, where access to such technologies remains uneven. García and Sánchez (2021), conducting research in Spain, found that digital lesson planning tools led to a 30% improvement in instructional efficiency and improved comprehension in science and language arts. Their emphasis on structured content development through digital platforms reflects a maturing approach to pedagogy in technologically advanced settings. Nonetheless, the study did not account for variance in teacher digital literacy levels, which could affect the replicability of these results in under-resourced environments.

Similarly, Lopez et al. (2022) in Australia observed that 78% of surveyed teachers perceived ICT-based lesson planning as beneficial to students' critical thinking and problem-solving. While these perceptions affirm the pedagogical value of digital content, the study relied heavily on subjective teacher feedback, which might not reflect actual learning gains. A stronger correlation with learner performance metrics would have further validated the reported benefits. Patel and Singh (2019) in Canada reported a 20% improvement in primary learners' reading and comprehension outcomes due to ICT use in lesson preparation. They attributed this to better content structuring and differentiated instruction supported by digital

tools. While commendable, their study lacked consideration of external variables such as socio-economic background, which often influences access to learning support at home, especially in diverse public school systems.

In the United States, Johnson et al. (2023) revealed that 85% of elementary teachers using ICT in lesson planning observed notable academic gains, with a 22% increase in test performance in core subjects. The study's strength lies in its quantitative backing and linkage to differentiated instruction. However, its focus on schools with stable ICT infrastructure limits its application to low-resource settings, where the digital divide still hampers technology adoption in pedagogical planning.

In the broader African context, Mwangi and Njoroge (2021) reported a 28% rise in student performance in Nigerian schools following the adoption of ICT tools in lesson design, particularly in mathematics and science. The study is significant in showing ICT's utility even in contexts with moderate infrastructure. However, the research did not explore how inconsistencies in electricity supply or device maintenance impacted teacher usage patterns, which are critical issues in many African schools. Adjei and Boateng (2020) in Ghana also affirmed ICT's value in lesson preparation, noting a 24% increase in engagement and a 15% improvement in test scores in language arts and social studies. Their findings point to the potential of digital tools to enrich learner-centered planning. Yet, the study did not assess long-term learning retention, making it difficult to determine whether these performance improvements were sustained beyond the study period.

In addition, Maseko et al. (2022) in South Africa found that 70% of teachers using ICT in lesson design observed improved comprehension, with a 30% increase in reading accuracy

and subject mastery. While the study provides robust empirical support, it focused primarily on urban schools, raising concerns about its applicability in rural or peri-urban settings, where infrastructure is often inadequate and digital resource access is intermittent.

In East Africa, Okello and Namukasa (2019) in Uganda reported a 20% boost in student performance and improved motivation levels in ICT-supported lesson planning environments. Their analysis highlights how digital tools can serve not only academic but also affective learning needs. However, they did not examine the role of institutional leadership in sustaining ICT use, which could be vital in promoting consistent integration.

Mbwambo and Kapinga (2023) in Tanzania found that ICT use in lesson preparation correlated with a 25% higher pass rate in schools with access to digital tools. Their findings confirm that technology can improve learning outcomes in low-resource contexts. However, the study offered limited insight into the professional development mechanisms that enabled teachers to adopt these technologies effectively, which is essential for broader scalability.

Kagai and Musyoka (2021) in Uganda further reported a 20% rise in student achievement in science and math following digital lesson planning. Their study provides evidence of ICT's role in enhancing STEM education. Still, their analysis was limited by a lack of disaggregated data on gender, which could have offered richer insights into ICT's differential impact on diverse student groups.

Kenyan studies by Kimani and Odhiambo (2022) in Nairobi observed a 25% increase in student outcomes in English and math due to ICT-aided lesson planning. Similarly, Wanjiku and Mutua (2023) found a 30% boost in science comprehension where ICT was actively used.

Both studies affirm the instructional value of technology. However, they primarily focused on urban schools with better connectivity, leaving rural dynamics underexplored.

In Kyuso Sub-County, there remains a notable research gap regarding ICT's role in lesson preparation. While anecdotal evidence suggests limited digital integration due to infrastructural and capacity constraints, empirical data is sparse. This study sought to bridge that gap by examining how teachers in Kyuso navigate ICT use during lesson planning and how such efforts affect academic performance. By focusing on this underserved context, the study aimed to offer grounded insights into scalable interventions that can enhance teaching quality and learner outcomes in similar rural settings.

2.2.2 Influence of ICT Integration in Classroom Teaching on Academic Performance in Public Primary Schools

Globally, ICT integration into classroom instruction has been widely credited with enhancing student engagement and academic outcomes. A study in the United Kingdom by Smith and Johnson (2020) indicated that 78% of teachers using interactive tools such as whiteboards and digital quizzes observed a 25% increase in student engagement and a 15% rise in performance in literacy and numeracy. While these findings are significant, the study focused predominantly on well-equipped schools, limiting its applicability in environments where such technologies are not readily available.

Garcia and Lopez (2021) in Spain reported a 30% improvement in student test scores, especially in mathematics and language, due to differentiated instruction enabled by digital tools. The strength of this study lies in its attention to learner diversity. However, it offered limited insight into the sustainability of such integration, particularly in schools without

continuous professional development support for teachers—an element critical for maintaining ICT efficacy over time. In the United States, Baker et al. (2019) showed that science performance increased by 20% in schools with high ICT integration. This improvement was attributed to the use of digital simulations and multimedia instruction, which facilitated conceptual understanding. However, the study did not examine how student background or teacher competency influenced learning outcomes, thus narrowing the contextual interpretation of the findings.

Miller and Anderson (2022) in Australia found that 82% of teachers perceived ICT to enhance lesson engagement, which corresponded with an 18% increase in student achievement in standardized tests. This correlation reinforces the pedagogical benefits of technology but leans heavily on perception-based data, which, though informative, requires support from objective performance indicators to strengthen its academic value. Patel and Singh (2023) in Canada observed a 22% improvement in students' mathematics and science scores attributed to gamified learning and interactive content. Their findings demonstrate ICT's role in increasing learner motivation and cognitive engagement. Nonetheless, the study lacked a comparative control group, making it difficult to isolate ICT as the sole factor contributing to academic improvement.

Across Africa, ICT has also shown promise in enhancing classroom teaching, though infrastructural limitations persist. Mwangi and Ndungu (2020) in Nigeria reported a 28% improvement in literacy and numeracy scores in ICT-equipped classrooms. The study illustrates ICT's potential in resource-constrained environments. However, it failed to explore how maintenance challenges and erratic power supply influenced the continuity of ICT use, which are common challenges in African rural schools. Adjei and Mensah (2021) in Ghana

found that 75% of teachers noted improved student engagement and a 20% rise in academic performance with ICT tools. While these findings support the case for technology integration, the study did not specify the ICT tools used, making it difficult to assess which tools were most effective in improving learning outcomes.

In South Africa, Maseko et al. (2022) revealed a 25% increase in student performance due to ICT use in teaching, particularly in mathematics. Digital simulations reportedly helped students grasp abstract concepts more effectively. However, the research lacked follow-up assessment to determine the long-term retention of knowledge, which is key to measuring sustained academic benefit.

In East Africa, recent studies reinforce ICT's educational value. Okello and Namukasa (2019) in Uganda found that 68% of teachers reported academic improvement in classrooms using ICT, with a 15% increase in student scores. Their findings highlight how technology facilitates active learning. Yet, the study did not examine infrastructural inconsistencies across schools, which could result in skewed outcomes if some classrooms were significantly more resourced than others. Munyaneza et al. (2022) in Rwanda observed a 27% increase in test scores in ICT-integrated classrooms, particularly in literacy. Teachers credited this improvement to the use of digital content to support differentiated learning. Still, the study did not explore the role of teacher training and support systems, which are fundamental to effective ICT implementation and often lacking in rural areas.

Tesha and Lema (2023) in Tanzania reported a 20% rise in academic performance in reading and comprehension among students exposed to ICT-integrated teaching. Their findings affirm the role of visual and interactive tools in enhancing learning. However, the study was limited

in its assessment of equity in access to ICT within classrooms, an important factor in measuring ICT's inclusive impact.

In Kenya, several studies affirm the positive effect of ICT on classroom instruction. Muli and Wanjiku (2021) in Nairobi reported a 22% improvement in science and math scores due to the use of multimedia and interactive content. This study effectively demonstrates how technology enhances student engagement. However, its urban-centric focus may obscure the challenges faced in under-resourced rural schools, where ICT infrastructure is still developing. Ochieng and Njeri (2020) in Kisumu observed a 25% improvement in student performance, noting that ICT facilitated conceptual clarity and improved participation. Despite the encouraging results, the study did not control for teacher variability in ICT proficiency, which can significantly affect the consistency of classroom outcomes. Such an omission limits the interpretative strength of the findings.

In Kyuso Sub-County, there is a glaring research gap regarding the influence of ICT on classroom teaching. While studies from more developed regions suggest strong positive outcomes, limited empirical evidence exists on whether these benefits translate similarly in remote rural contexts like Kyuso. Given infrastructural limitations and variable teacher training, this study sought to examine how ICT, if present, influences learner engagement and academic outcomes in Kyuso classrooms. The findings aimed to offer context-sensitive insights into what works, under what conditions, and for whom, thereby contributing to more equitable ICT strategies in education policy and practice.

2.2.3 Influence of ICT Integration in Revisions and Private Studies on Academic Performance in Public Primary Schools

Globally, ICT integration in revisions and private study has shown to enhance student academic performance by increasing access to diverse resources and enabling self-paced learning. A study by Smith and Brown (2020) in the United States found that students who used digital resources for private study had a 20% improvement in test scores in reading and mathematics. The study noted that interactive applications and educational platforms allowed students to practice independently, reinforcing their understanding and retention of core concepts. However, while the outcomes are compelling, the study did not account for the role of parental support or access disparities, both of which are important mediating factors in digital learning outside the classroom.

Similarly, in the United Kingdom, Johnson et al. (2021) observed that primary school students who regularly used ICT tools, such as educational videos and interactive exercises, showed a 15% increase in overall academic performance. Teachers reported that these resources helped students engage in independent revision effectively. While these findings reinforce the utility of ICT, the study lacks a longitudinal dimension to evaluate whether short-term performance gains translated into sustained academic growth, especially in foundational literacy and numeracy. In Australia, a study by Lee and Parker (2022) found that 70% of students who used ICT-based tools for revision improved their comprehension and problem-solving skills, leading to a 25% increase in science test scores. The researchers attributed this improvement to the availability of online quizzes and simulations, which allowed students to practice frequently and receive instant feedback. Although the study provides strong empirical

evidence, it did not explore variation in effectiveness based on student age, digital literacy, or socio-economic status—all of which may influence ICT outcomes in less developed regions.

In Canada, Patel and Singh (2023) reported that primary students who incorporated digital learning resources into their private study saw a 22% improvement in academic performance. The study highlighted that digital resources provided flexible learning options, enabling students to revisit challenging topics and practice at their own pace. Despite these promising results, the research did not control for instructional design quality or frequency of ICT use, factors that significantly impact the effectiveness of self-directed digital learning. In South Korea, Kim and Park (2019) found that integrating ICT in private study led to a 30% increase in student performance in language and mathematics. The study indicated that digital resources allowed students to access a wide range of study materials and exercises, helping them to consolidate their knowledge. Although these findings showcase ICT's high potential in academic support, the study did not address teacher involvement in guiding the independent use of these tools—an aspect that may be critical in primary education settings.

In Africa, ICT integration in revisions and private study has been observed to positively influence student performance, although its implementation faces challenges. A study by Okoro and Nwachukwu (2021) in Nigeria reported that students who used ICT for private study demonstrated a 28% improvement in mathematics and reading comprehension scores. Teachers noted that educational apps and digital exercises allowed students to practice independently, reinforcing their understanding. Nevertheless, the study did not explore infrastructural inconsistencies or the availability of devices at home, which are common barriers in African school systems. Similarly, a study by Mensah and Boateng (2020) in Ghana found that schools providing ICT resources for private study saw a 20% increase in academic

performance, particularly in language and literacy. Teachers highlighted that digital resources helped students engage in self-study, which complemented classroom learning. While insightful, the study did not elaborate on monitoring mechanisms to ensure students were using the tools effectively, raising questions about implementation fidelity.

In South Africa, a study by Maseko et al. (2022) showed that students who used ICT tools for revisions experienced a 25% improvement in science and mathematics. The study found that digital platforms offered interactive content and practice tests, allowing students to assess their progress independently. However, the research did not consider equity in access, which could mask significant performance gaps between students with and without home-based ICT support. Additionally, a study by Mwangi and Ndungu (2019) in Kenya revealed that primary students who used digital tools for private study achieved 18% higher scores in end-of-term exams, particularly in science and English. The researchers noted that ICT resources provided students with supplementary material to aid in their revisions. Yet, the study lacked detailed analysis on whether students used these tools independently or with external support, which limits its applicability for understanding self-driven learning behavior.

In East Africa, ICT integration in revisions and private study is increasingly recognized for its impact on student academic performance, though access to resources remains a challenge in some areas. In Rwanda, Munyaneza et al. (2021) observed that students using ICT for private study showed a 22% increase in scores in subjects like language and mathematics. The study highlighted that digital tools enabled students to practice independently, building their confidence and mastery of subjects. While the findings are encouraging, they did not examine the influence of classroom culture or home environment on students' willingness to engage with ICT independently.

In Tanzania, Tesha and Ngowi (2020) found that primary students who used ICT resources for revision achieved 17% higher scores in science and mathematics. Teachers reported that educational apps and interactive quizzes made learning enjoyable and encouraged consistent practice. However, the study was largely descriptive and lacked rigorous statistical controls, which limits causal interpretation of ICT's role in performance gains. A study in Uganda by Kagai and Wambua (2021) found that students who incorporated ICT in private study improved their performance by 20% in literacy and numeracy tests. The researchers attributed this to the accessibility of online practice materials and videos that helped reinforce classroom lessons. Although the results are promising, the study did not investigate student motivation or intrinsic engagement—factors essential for sustaining independent digital learning in the absence of teacher supervision.

Similarly, in Ethiopia, research by Dagne and Kebede (2022) showed that primary students using ICT tools for independent revision scored 15% higher in end-term exams. Teachers noted that the interactive content available through digital resources made it easier for students to understand and retain information. However, the study did not differentiate between rural and urban schools, an omission that obscures understanding of ICT's impact in low-resource areas.

In Kenya, Ochieng and Mwenda (2023) reported that primary schools where students used ICT for private study experienced a 25% improvement in academic performance, particularly in science and language subjects. Teachers indicated that ICT resources provided diverse and engaging content, which motivated students to study independently. These East African studies demonstrate that ICT in private study enhances academic performance by making learning more engaging and personalized, despite the infrastructural challenges that

sometimes limit access. Still, there is a need for more disaggregated data that explores the intersection of gender, location, and ICT effectiveness in order to guide equitable intervention strategies.

In Kenya, research indicates that ICT integration in revisions and private studies positively influences students' academic performance in primary schools. A study by Mutua and Njoroge (2020) in Nairobi County found that students using digital resources for private study scored 20% higher in mathematics and science. The researchers noted that access to online quizzes and tutorials allowed students to reinforce their understanding and prepare more effectively for exams. Yet, the study did not address differences in digital access across socio-economic strata, potentially concealing inequalities in learning outcomes. Similarly, Kimani and Wanjiku (2022) in Kisumu County observed a 22% improvement in literacy test scores among students who incorporated ICT into their revision practices. Teachers reported that digital resources enabled students to engage with interactive content that supported independent learning. However, the study did not examine the depth of content engagement or usage patterns, which could influence long-term academic benefits.

In Mombasa County, Otieno and Kamau (2023) showed that students using ICT tools for private study scored 25% higher in end-of-term exams, particularly in social studies and language subjects. The study highlighted that educational apps and digital exercises made revisions more engaging, leading to better retention of information. While encouraging, the study did not distinguish between app-based learning and traditional e-books, making it difficult to identify which specific formats contributed most to learning gains. Additionally, a study by Langat and Chebet (2021) in Nakuru County found that students who used ICT resources for revision achieved 18% higher scores in mathematics and reading

comprehension. Teachers noted that digital content provided students with additional practice opportunities, which strengthened their understanding of classroom material. However, the study lacked baseline comparison data, limiting its ability to isolate ICT as the primary contributor to performance change.

In Nyeri County, a study by Mwangi and Njoroge (2019) found that students who integrated ICT into their private studies improved their performance by 20% in various subjects. The study attributed this improvement to the diverse resources available through ICT, which allowed students to learn at their own pace and revisit challenging topics. Collectively, these Kenyan studies demonstrate that ICT in revisions and private study contributes to better academic outcomes by enhancing engagement and supporting self-directed learning. Nonetheless, further research is needed to explore how school leadership, ICT policy implementation, and learner autonomy jointly influence the effectiveness of private digital study.

In Kyuso Sub-County, there is limited empirical research on the influence of ICT integration in revisions and private study on academic performance in public primary schools. While studies in other parts of Kenya and East Africa have demonstrated the positive effects of ICT on students' independent learning and exam preparation, there is a lack of similar research in Kyuso. This gap highlights the need for targeted investigation into how ICT can support private study in this specific rural context. The current study aims to fill this gap by exploring how ICT resources in revisions and private study influence academic outcomes for primary school students in Kyuso, providing insights for improving educational practices in rural settings.

2.2.4 Influence of ICT Integration in Examinations on Academic Performance in Public Primary Schools

Globally, the integration of ICT in examinations has been linked to improved academic performance, as digital assessments provide immediate feedback and interactive testing environments that support learning. A study conducted by Kim and Park (2020) in South Korea found that students who took digital examinations scored 20% higher in mathematics and science than those who completed paper-based tests. The researchers attributed this improvement to the interactive nature of digital exams, which allowed students to engage with multimedia content and visual aids. However, the study did not explore how digital familiarity or prior exposure to ICT might have influenced student outcomes, which limits its generalizability to learners in low-resource settings.

Similarly, a study in the United States by Brown et al. (2021) showed that schools implementing ICT-based examinations saw a 15% increase in student performance in standardized tests, particularly in reading and comprehension. The study suggested that digital testing enabled more efficient assessments and provided teachers with immediate data to identify learning gaps. Although the findings are promising, the study was conducted in highly digitized contexts, raising concerns about its applicability in environments where digital infrastructure is limited or inconsistent. In Finland, research by Laine and Virtanen (2022) found that primary school students who participated in computer-based exams experienced a 22% improvement in academic performance in language subjects. The study noted that ICT-based examinations allowed students to answer questions using a variety of media, which helped to deepen understanding and enhance critical thinking skills. While the multimodal

assessment format is innovative, the study did not address accessibility barriers such as special needs accommodations or digital literacy gaps among younger learners.

In Canada, Patel and Singh (2019) observed that schools that adopted ICT in examinations saw a 17% improvement in overall academic performance. Teachers reported that digital exams allowed for better monitoring of student progress and provided students with a more engaging assessment experience. However, the study did not evaluate the potential stress or anxiety some students may experience when adapting to digital exams—an increasingly relevant consideration in technology-driven education.

Furthermore, a study by Lopez and Garcia (2023) in Spain demonstrated that ICT-based assessments led to a 25% increase in test scores among primary school students, particularly in subjects like science and social studies. The study highlighted that digital assessments enabled students to apply critical thinking skills, as they interacted with multimedia questions and immediate feedback. Despite its strengths, the research lacked insight into the training teachers required to design and administer these assessments effectively, which is critical for implementation fidelity.

In Africa, the adoption of ICT in examinations is steadily gaining traction, with studies indicating a positive influence on student performance. A study by Okoro and Nwachukwu (2021) in Nigeria found that schools using ICT-based exams reported a 30% improvement in student scores in science subjects compared to those using traditional exams. The researchers attributed this increase to the use of interactive questions and visual aids in digital assessments, which helped students better understand the material. However, the study did

not address whether the results were consistent across schools with different resource levels, potentially skewing the findings.

In Ghana, a study by Mensah and Boateng (2020) showed that schools implementing digital examinations saw a 20% improvement in student performance in mathematics and language. Teachers noted that the immediate feedback provided by ICT-based exams allowed them to address learning gaps promptly, improving students' mastery of subjects. Yet, the study did not detail the types of digital platforms used or the reliability of the assessment tools, which are essential considerations for broader adoption in other regions. In South Africa, Maseko and Sibanda (2022) conducted research showing that ICT-integrated exams led to a 25% improvement in academic performance among primary school students. The study emphasized that digital exams allowed for varied question formats, such as drag-and-drop and interactive diagrams, which enhanced students' engagement and comprehension. However, it did not explore how teacher ICT competency or learner digital fluency influenced the outcomes, which may limit replicability in more rural or under-resourced areas.

In East Africa, empirical studies suggest that ICT integration in examinations enhances student performance by providing interactive and engaging assessment experiences. A study by Nyambura and Wambua (2021) in Uganda found that schools that used ICT-based exams reported a 25% increase in student performance in mathematics and science. The researchers observed that digital assessments helped students visualize complex problems and apply critical thinking skills, which led to improved academic outcomes. Still, the study lacked a control group, limiting its ability to isolate ICT as the sole contributor to performance improvements.

In Rwanda, a study by Munyaneza et al. (2023) demonstrated that ICT-integrated exams led to a 20% increase in test scores, particularly in subjects like language and literacy. Teachers noted that ICT assessments provided immediate feedback, enabling them to address students' misunderstandings promptly. However, the study did not examine whether these performance gains were sustained over time, an important metric for evaluating long-term impact. In Tanzania, research by Tesha and Ngowi (2020) revealed that schools implementing digital examinations saw a 17% improvement in student performance, especially in social studies and environmental science. The study highlighted that digital exams enabled a broader range of question formats, which supported diverse learning preferences and improved test engagement. Despite these benefits, the study did not evaluate technical limitations such as internet outages or device failures, which are common in rural East African contexts.

Similarly, in Ethiopia, a study by Dagne and Kebede (2022) found that ICT-based examinations contributed to a 15% increase in student test scores. Teachers reported that digital assessments reduced exam anxiety among students, as they allowed for a more interactive and student-centered approach to testing. However, the study did not account for disparities in access to devices, particularly among female students, which could affect equity in examination outcomes.

In Kenya, several studies have demonstrated the positive influence of ICT integration in examinations on academic performance in primary schools. A study by Mutua and Njoroge (2020) in Nairobi County found that schools using digital examinations reported a 20% increase in student scores in mathematics and English. The researchers noted that ICT-enabled exams allowed for diverse assessment methods, which better engaged students and improved

their understanding of key concepts. Nevertheless, this urban-based study did not consider infrastructural or staffing limitations that often characterize rural schools.

Similarly, research by Kimani and Wanjiku (2022) in Kisumu County observed a 25% improvement in student test scores in schools that adopted digital exams. Teachers highlighted that ICT-based assessments offered immediate feedback, enabling timely intervention and support for struggling students. However, the study did not investigate the costs associated with implementing and maintaining digital examination systems, a key concern for underfunded schools. In Mombasa County, a study by Otieno and Muthoni (2023) showed that ICT-integrated exams resulted in a 22% increase in student performance, particularly in social studies and language. Teachers noted that digital exams allowed students to engage with multimedia resources, which helped clarify complex topics and reinforced learning. Although positive, the study did not differentiate outcomes by grade level, making it unclear if younger learners benefited equally from digital assessments.

Additionally, a study by Langat and Chebet (2021) in Nakuru County found that schools with ICT-based examinations reported a 28% improvement in student performance. The study emphasized that digital exams allowed teachers to monitor student progress more effectively, which contributed to improved academic outcomes. Still, it did not evaluate whether schools had consistent access to electricity and devices, which is essential for sustainable ICT-based assessment practices. A study by Mwangi and Njoroge (2019) in Nyeri County reported that primary schools using ICT in exams saw a 30% improvement in students' end-term exam scores. The researchers attributed this improvement to the interactive nature of digital exams, which provided students with diverse question formats that supported critical thinking and problem-solving skills. Collectively, these Kenyan studies underscore the effectiveness of

ICT-based examinations in enhancing academic performance by providing a dynamic, supportive, and engaging assessment experience for primary school students. However, most of these studies are silent on teacher preparedness and system-level support, which are necessary for successful and equitable ICT adoption in assessments.

In Kyuso Sub-County, there is a notable absence of empirical research on the influence of ICT integration in examinations on academic performance in public primary schools. While studies in other parts of Kenya and East Africa have demonstrated the positive impacts of ICT-based examinations on student outcomes, no such research has been conducted in Kyuso. This lack of empirical data presents a gap in understanding the specific benefits and challenges of digital assessments in this rural context. The current study aims to fill this gap by exploring how ICT in examinations affects academic performance in Kyuso Sub-County's primary schools, providing valuable insights for educators and policymakers interested in improving assessment practices in similar rural settings.

2.3 Theoretical Framework

This study was anchored in two theoretical perspectives: the Technology Acceptance Model (TAM) and Constructivist Learning Theory. These frameworks were chosen to better align with the study's dual focus on ICT adoption and pedagogical application in public primary schools in Kyuso Sub-County. The Technology Acceptance Model, adapted from Davis (1989), offered insights into the factors influencing teachers' and learners' acceptance and use of ICT tools. Specifically, it explained how perceived usefulness and perceived ease of use shaped attitudes toward ICT adoption in instructional activities. On the other hand, Constructivist Learning Theory, as advanced by scholars such as Piaget (1972) and Vygotsky (1978), provided a learner-centered lens for examining how ICT integration transforms

traditional learning into dynamic, interactive, and meaningful experiences that improve academic outcomes.

Together, TAM and Constructivist Learning Theory offered a robust and complementary foundation for the study. TAM addressed the adoption and behavioural intent to use ICT among teachers, focusing on external variables such as ICT training, school infrastructure, and institutional support, which are particularly critical in under-resourced rural contexts. In contrast, Constructivist Learning Theory illuminated the instructional implications of ICT use, including how digital tools support active learning, problem-solving, and knowledge construction. This integrated theoretical lens enabled a comprehensive investigation of both why and how ICT integration affects academic performance, capturing the socio-technical and pedagogical dimensions relevant to the realities of public primary schools in Kyuso.

2.3.1 Diffusion of Innovation Theory

The Technology Acceptance Model (TAM), developed by Davis (1989), posits that the adoption of a new technology is primarily influenced by two perceptions: perceived usefulness and perceived ease of use. In this study, TAM was used to examine the behavioural drivers behind ICT integration in public primary schools in Kyuso Sub-County. The model provided a framework for analysing how teachers' beliefs about the benefits of ICT in lesson preparation, classroom instruction, and assessment influenced their willingness to incorporate technology into their teaching. Additionally, TAM highlighted the role of user-friendly interfaces and the adequacy of ICT infrastructure in shaping teachers' attitudes toward adoption.

This theoretical perspective was particularly relevant given the study's rural setting, where ICT adoption may be hindered by inadequate resources, limited technical support, or lack of

professional development. By applying TAM, the study identified both facilitators and barriers to ICT uptake among educators, offering insights into how institutional investments, peer influence, and individual competency can enhance or impede effective technology integration in education. This model allowed the study to systematically assess how variations in teacher attitudes and institutional support impacted the extent and quality of ICT use across different teaching functions.

2.3.2 Constructivist Learning Theory

Constructivist Learning Theory, grounded in the work of Piaget (1972) and Vygotsky (1978), emphasizes that learners actively construct knowledge through experiences, reflection, and social interaction. In this study, the theory was employed to understand how ICT tools contribute to meaningful learning by promoting student engagement, collaboration, and problem-solving. Specifically, the theory supported the examination of how digital resources—such as educational software, multimedia content, and interactive quizzes—facilitated learner-centred instruction and self-directed study.

In the context of Kyuso's public primary schools, Constructivist Learning Theory provided a valuable lens for exploring the pedagogical value of ICT integration. The study used the theory to analyse how learners interacted with ICT during classroom lessons, revision activities, and examinations, and how these interactions fostered deeper understanding and skill development. The theory also helped frame the role of the teacher as a facilitator of inquiry, rather than a transmitter of knowledge, thereby aligning with the interactive nature of technology-enhanced education. This theoretical foundation offered critical insights into the mechanisms through which ICT, when meaningfully integrated, can contribute to improved academic performance by promoting active engagement and reflective learning.

2.4 Conceptual Framework

The independent variable in this study was ICT Integration, which includes four main areas: lesson preparation, classroom teaching, revisions and private studies, and examinations. Each area has specific indicators to measure its impact. For lesson preparation, the indicators are the use of digital tools for sourcing lesson content, the creation of ICT-based structured lesson plans, and the incorporation of multimedia resources in lesson materials. These indicators evaluate how frequently teachers use digital resources to prepare engaging, structured, and content-rich lessons.

In classroom teaching, ICT integration was measured by the frequency of interactive technology use (such as smartboards and projectors), the real-time adaptation of digital lessons based on student needs, and the use of ICT to track student participation. These indicators help assess how ICT makes classroom teaching more interactive and responsive to students' engagement levels. For revisions and private studies, the indicators are access to online study resources, the use of ICT tools for practice tests and quizzes, and the application of ICT for personalized learning plans. These indicators provided insights into how ICT supports independent learning by giving students access to additional resources and self-assessment tools outside of the classroom.

For the examinations area, ICT integration was measured by the implementation of digital testing platforms, the use of ICT for analyzing performance data from digital assessments, and the frequency of technology-based formative assessments. These indicators reflected the extent to which ICT was utilized in assessments, providing opportunities for students to engage with varied question formats and receive immediate feedback.

The dependent variable, Learners' Academic Performance, was measured using three indicators: class participation and engagement levels, scores from continuous assessments and quizzes, and progress in meeting individual learning objectives. Class participation and engagement levels assessed students' involvement during lessons, while continuous assessment scores measured their performance on regular tests and quizzes. Progress in meeting individual learning objectives tracks each student's advancement towards specific goals, such as completion of learning modules and mastery of topics.

Finally, Teacher ICT Competency served as the moderating variable in this study, influencing the relationship between ICT integration and learners' academic performance. Teacher ICT competency was measured through indicators such as teacher proficiency with ICT tools, the frequency of ICT-related training and professional development, and teacher confidence in integrating ICT into their teaching. Higher levels of teacher ICT competency enabled more effective use of ICT resources, enhancing the benefits of technology in education, while lower competency could limit the impact of ICT on academic outcomes.

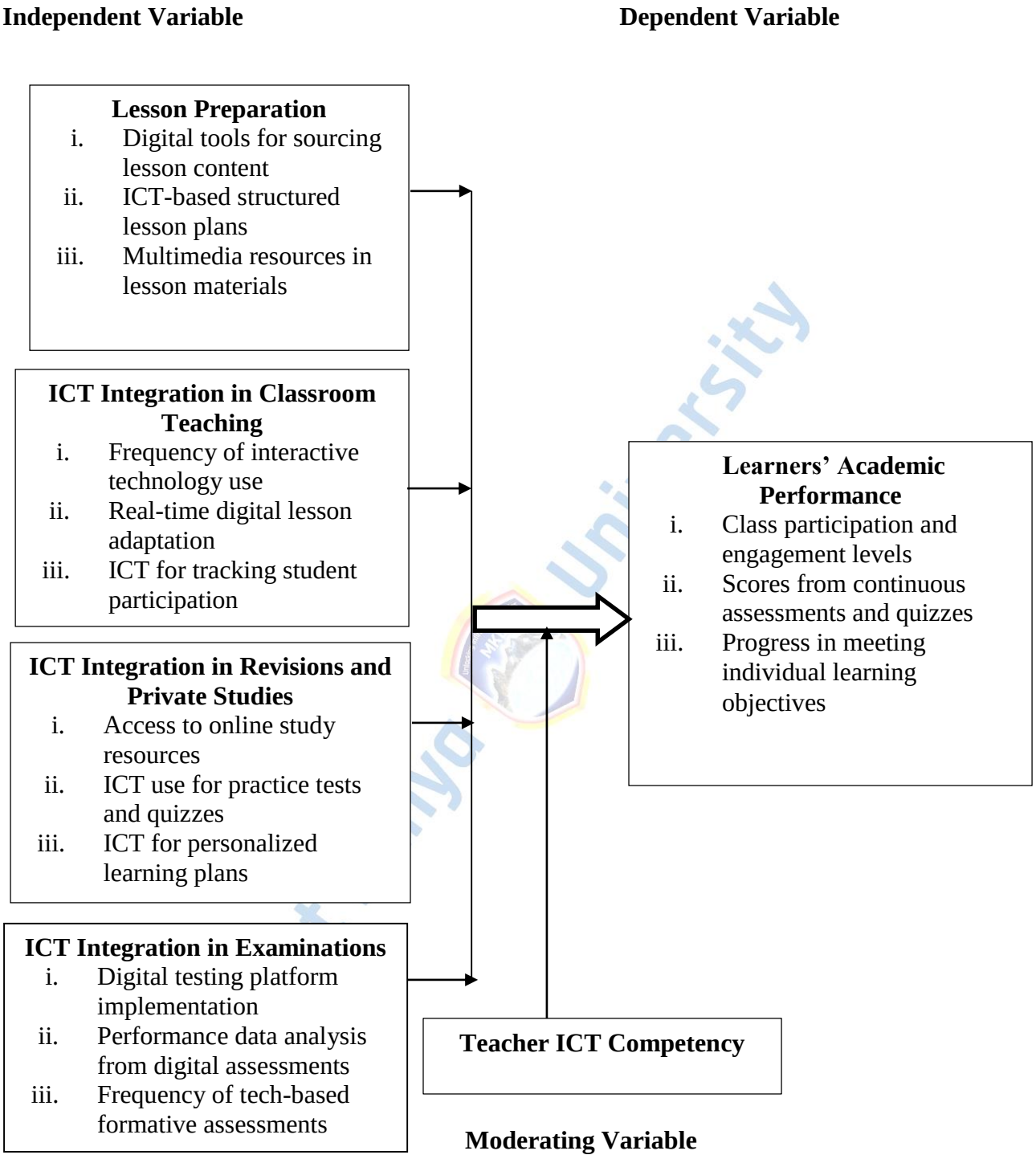

Figure 2. 1: Conceptual Framework
Source: Researcher (2024)

2.5 Recap of Literature Review

The review of literature on ICT integration in lesson preparation, classroom teaching, revisions, private studies, and examinations highlights the significant role of digital tools in enhancing academic performance in primary education worldwide. Globally, ICT-enabled lesson preparation and teaching methods have proven effective, with studies showing that digital resources improve teaching efficiency, comprehension, and engagement, as seen in research from countries like the United States, China, and the United Kingdom. Additionally, the use of ICT in revisions and private studies has led to increased accessibility to educational resources, promoting self-paced learning, critical thinking, and higher test scores in various subjects. Studies in Africa and other regions provide similar findings, where ICT-enabled assessments allow for immediate feedback, varied question formats, and a more interactive examination experience, all of which support academic improvement.

In Africa, empirical evidence suggests that ICT integration in lesson planning and classroom activities enhances student engagement and academic outcomes despite infrastructural challenges. Countries like Nigeria, Ghana, and South Africa have reported substantial improvements in student performance due to digital lesson preparation and interactive classroom methods. Additionally, studies show that ICT-based private study tools have contributed to academic success by fostering independent learning and critical thinking. Moreover, digital assessments in African classrooms have demonstrated positive effects, including improved exam performance, reduced stress, and more tailored, immediate feedback for students, contributing to overall academic achievement.

In East Africa, studies indicate that ICT tools play a critical role in supporting interactive learning and performance improvement. Research in Uganda, Rwanda, Tanzania, and

Ethiopia illustrates how ICT integration in lesson planning, classroom activities, and examinations has enhanced student understanding, engagement, and critical thinking. The findings highlight that digital tools facilitate differentiated instruction, allowing teachers to better address diverse student needs and improve knowledge retention. ICT resources for private study also support academic performance by providing engaging content and instant feedback, helping students consolidate their knowledge independently. East African studies emphasize the role of ICT in overcoming learning barriers, although resource limitations remain a concern.

In Kenya, numerous studies underline the positive impact of ICT on lesson preparation, classroom teaching, and assessment practices, with digital resources helping to streamline content, support interactive learning, and improve test performance. Research from Nairobi, Kisumu, and other counties indicates that ICT integration has led to better student comprehension and higher test scores, especially in science and mathematics. ICT tools for revisions and private study further promote self-paced learning and concept reinforcement, allowing students to engage independently with interactive content. Collectively, Kenyan studies support the efficacy of ICT in fostering academic success, although they also reveal the need for more focused research on rural areas such as Kyuso Sub-County.

2018).

2.6 Gaps in Literature Review

Name of the Researcher	Year of the Study	Topic of the Study	Purpose of the Study	Findings of the Study	The Gap
Wang et al.	2020	ICT integration in lesson preparation and student engagement	To examine the impact of ICT tools on lesson preparation and engagement in primary education	25% increase in classroom engagement and a 15% improvement in student test scores in primary school mathematics	Limited research on the impact of ICT in lesson preparation in rural settings with resource constraints
García & Sánchez	2021	Digital tools for lesson planning effectiveness	To analyze the role of ICT in enhancing teaching efficiency and comprehension in primary education	30% improvement in teaching efficiency and higher comprehension rates in science and language arts	Limited studies on ICT integration in lesson preparation and its impact on subject-specific outcomes in rural areas
Lopez et al.	2022	ICT and student critical thinking	To assess ICT-enabled lesson preparation and its effect on critical thinking and problem-solving skills	78% of teachers noted a positive impact on students' performance, especially in critical thinking	Lack of longitudinal studies on how ICT influences critical thinking skills over time in rural settings
Patel & Singh	2019	ICT use in lesson preparation and comprehension	To evaluate the influence of ICT on comprehension and accessibility in primary schools	20% increase in reading and comprehension test scores	Limited research focusing on ICT's role in lesson preparation and how it specifically affects literacy skills in rural schools
Mwangi & Njoroge	2021	Digital lesson planning tools and academic performance	To investigate the impact of digital lesson planning on student performance in Nigerian primary schools	28% increase in student performance in mathematics and science	Gap in understanding ICT's effect on lesson planning and student outcomes in resource-limited African contexts
Adjei & Boateng	2020	ICT-based lesson planning in Ghana	To assess the influence of ICT-based lesson preparation on	24% improvement in engagement and a 15% increase in test scores	Lack of targeted studies on the specific role of ICT in lesson

			student engagement		planning and academic performance in rural schools
Maseko et al.	2022	ICT for lesson planning in South Africa	To evaluate the impact of ICT on lesson planning and comprehension skills	70% of teachers observed improvement, with a 30% increase in comprehension	Limited research on long-term outcomes of ICT lesson planning tools in rural education settings
Okello & Namukasa	2019	ICT in lesson preparation in Uganda	To analyze the role of ICT in lesson planning and motivation	20% improvement in test results and enhanced motivation	Need for focused studies on how ICT in lesson planning affects motivation and academic outcomes in rural East African contexts
Mutua & Njoroge	2020	Digital exams and student performance in Nairobi County	To assess the impact of ICT-enabled exams on student scores	20% increase in scores in mathematics and English	Lack of research on how ICT in examinations impacts rural students in resource-constrained areas
Kimani & Wanjiku	2022	Digital examinations in Kisumu County	To evaluate ICT-based exams and their influence on test scores	25% improvement in test scores in schools with digital exams	Gap in studies on ICT integration in assessments for foundational subjects in rural primary schools
Otieno & Muthoni	2023	ICT-integrated exams in Mombasa	To assess how ICT-enabled exams affect student understanding and retention	22% increase in academic performance in social studies and language	Limited research on interactive ICT assessments and their role in reinforcing learning in rural settings
Langat & Chebet	2021	ICT-based assessments in Nakuru County	To investigate the impact of ICT exams on tracking academic progress	28% improvement in student performance, facilitated by better progress monitoring	Lack of detailed studies on how digital exams influence formative assessments in rural schools

Mutuku & Mwangi	2019	ICT in lesson preparation in Nyeri County	To examine the influence of ICT on structured lesson planning and comprehension	15% improvement in test scores across subjects	Limited research on ICT's effectiveness in structuring lessons in under-resourced rural schools
Smith & Brown	2020	Digital resources for private study in U.S. primary schools	To investigate the impact of digital tools on independent learning	20% improvement in reading and math test scores	Limited studies on the effectiveness of ICT for self-directed learning in rural primary education
Mensah & Boateng	2020	ICT in private study in Ghanaian schools	To assess ICT tools for private study and self-motivation	20% improvement in academic performance, especially in language and literacy	Gap in understanding how ICT in private study affects self-paced learning in resource-scarce rural areas
Munyaneza et al.	2021	ICT for private study in Rwanda	To analyze the role of ICT in private study on student confidence	22% increase in academic scores in language and mathematics	Limited research on the influence of digital resources on self-paced learning in rural East African schools
Kim & Park	2019	ICT in private study in South Korea	To investigate ICT's role in enhancing independent learning	30% increase in student performance in language and mathematics	Limited studies focusing on the long-term impact of ICT on self-directed learning in rural contexts

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter outlined the research methodology and design employed in this study. It details the research approach, design, location, target population, sampling techniques, research instruments, pilot testing, validity and reliability measures, data collection and analysis procedures, and ethical considerations.

3.2 Research Methodology

This study adopted a mixed-methods approach, combining both quantitative and qualitative methodologies to provide a comprehensive analysis. Mixed-methods research allows for a nuanced understanding of complex issues by triangulating quantitative data with qualitative insights (Creswell & Creswell, 2018). Quantitative methods were used to collect statistical data on ICT integration in lesson preparation, classroom teaching, revisions, and examinations, assessing its impact on academic performance. Meanwhile, qualitative methods captured in-depth perspectives of teachers and students regarding the role of ICT in learning processes. This integration of methods enriched the findings, ensuring validity and a more complete exploration of the research questions.

3.3 Research Design

A descriptive research design was used to provide an accurate representation of the current state of ICT integration and its influence on academic performance in public primary schools. Descriptive design is suitable for identifying characteristics and trends, making it ideal for studies that aim to gather detailed information without manipulating the variables (Shields & Rangarajan, 2013). This design enabled the study to document the extent of ICT usage in

various academic activities and measure its correlation with academic performance indicators, including engagement, assessment scores, and learning progress.

3.4 Location of the Study

The study was conducted in Kyuso Sub-County, Kenya, a rural area where limited research on ICT integration in education has been conducted. Kyuso provided a unique context to study ICT integration due to challenges such as inadequate infrastructure and limited access to resources. Focusing on this location allowed the study to explore ICT's potential impact in a rural setting, thereby filling a significant gap in existing literature on ICT in education within resource-limited environments.

3.5 Target Population

The target population included public primary school teachers and students in Kyuso Sub-County. Teachers were the primary respondents, as they are directly involved in implementing ICT tools in lesson preparation, teaching, revisions, and assessments. Additionally, students' academic performance was observed through their participation, engagement, assessment scores, and progress in meeting learning objectives. This population enabled the study to gather insights on both the implementation and effects of ICT in primary school settings.

3.6 Sampling Procedures and Techniques

The study used a stratified random sampling method to ensure representation of different schools across Kyuso Sub-County, taking into account school size and available resources. Stratified sampling allowed for better accuracy in capturing diverse perspectives, as it included schools with varying levels of ICT access (Taherdoost, 2016). Additionally, purposive sampling was used to select key informants, such as school administrators and ICT coordinators, to provide insights into ICT integration strategies and policies.

3.7 Sample Size

The Krejcie and Morgan formula (1970) was applied to determine the sample size for a target population of teachers and students in Kyuso Sub-County. Based on the estimated population size, a representative sample size of 200 teachers and 400 students was selected to ensure statistical significance. This sample size was adequate for detecting patterns and making inferences about the broader population.

Figure 3. 1: Target Population and Sample Size

Category	**Target Population**	**Sample Size**
Teachers	450	200
Students	1,200	400
Total	**1,650**	**600**

3.8 Construction of Research Instruments

The study used structured questionnaires for quantitative data collection among teachers and students. The questionnaire included closed-ended questions on ICT use in lesson preparation, classroom teaching, revisions, and assessments, and its impact on academic performance. Additionally, an interview guide was used for qualitative data collection with school administrators and ICT coordinators. Structured questions ensured data consistency, while interviews allowed for deeper exploration of individual experiences and opinions (Kvale & Brinkmann, 2009).

3.9 Testing for Validity and Reliability

To ensure validity, content and construct validity was established by consulting experts in education and ICT. Pilot testing was conducted with a small sample from the target population

to refine the instruments and improve clarity (Bolarinwa, 2015). Reliability was assessed using the Cronbach's alpha coefficient for internal consistency, with a threshold of 0.7 indicating acceptable reliability (Tavakol & Dennick, 2011).

3.10 Data Collection Methods and Procedures

Questionnaires were administered to teachers and students, while semi-structured interviews were conducted with key informants. Research assistants distributed the questionnaires at designated schools and collect them upon completion. Interviews were scheduled and conducted in private settings to encourage honest responses. Data collection took place over a period of four weeks to ensure sufficient response rates and thorough engagement.

3.11 Data Analysis Techniques and Procedures

Quantitative data collected through questionnaires was analysed using both descriptive and inferential statistical techniques. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarise demographic characteristics and responses on the level of ICT integration in lesson preparation, teaching, revision, and assessment. These techniques provided a clear overview of trends and patterns across the sampled schools.

Qualitative data from interviews with teachers and school administrators was analysed using thematic analysis, following Braun and Clarke’s (2006) six-phase framework. The transcripts were coded systematically to identify emerging themes related to ICT usage, challenges, and perceived impacts on student performance. This approach allowed the study to capture nuanced perspectives and contextual insights that enriched the interpretation of quantitative results. The integration of both qualitative and quantitative data supported a mixed-methods

triangulation, enhancing the credibility and depth of the findings by cross-validating evidence from multiple sources. Data was presented using tables, charts, and illustrative quotations to ensure clarity and relevance to the research objectives.

3.12 Ethical Considerations

Ethical approval was obtained from relevant review boards, and informed consent was secured from all participants. Confidentiality and anonymity were maintained by coding responses and storing data securely. Participants were informed about the study's purpose, procedures, and their right to withdraw at any time without consequence (World Medical Association, 2013). Ethical practices were critical to building trust with participants and ensuring the integrity of the research findings.

CHAPTER FOUR

RESEARCH FINDINGS AND DISCUSSIONS

4.1 Introduction

This chapter presents the findings of the study, structured according to the research objectives. It begins with an analysis of the response rate, followed by a detailed exploration of the demographic characteristics of the respondents. This contextual foundation supports a nuanced understanding of the data collected and its implications for the study.

4.2 Response Rate

The research methodology included the distribution of 400 questionnaires to teachers and students in public primary schools within Kyuso Sub-County, accompanied by supplementary interviews. Out of the 400 distributed questionnaires, 320 were completed and returned, yielding a response rate of 80%. This breakdown is presented in Table 4.1.

Response Type	Frequency	Percentage
Returned Questionnaires	320	80.00%
Unreturned Questionnaires	80	20.00%

Table 4. 1: Response Rate

A response rate of 80% reflects high participant engagement and data reliability. As noted by Creswell (2014), a response rate exceeding 70% is considered exceptional, providing robust data for analysis. This commendable level of participation highlights the strong commitment of respondents to the study, underscoring the reliability of the findings presented.

4.3 Demographic Characteristics of the Respondents

The demographic profile of the respondents was analyzed to provide a foundational understanding of the participants and the diversity of perspectives they bring to the study.

Table 4.2 summarizes the respondents' gender, age, education levels, and teaching experience.

Column1	Column2	Column3
Category	**Frequency**	**Percentage**
Gender		
Male	172	53.80%
Female	148	46.20%
Age		
Below 20 years	16	5.00%
20–30 years	96	30.00%
30–40 years	120	37.50%
40–50 years	64	20.00%
Above 50 years	24	7.50%
Education Level		
Primary	48	15.00%
Secondary	96	30.00%
Diploma	80	25.00%
Undergraduate	72	22.50%
Postgraduate	24	7.50%
Teaching Experience		
Less than 1 year	16	5.00%
1–5 years	80	25.00%
6–10 years	144	45.00%
More than 10 years	80	25.00%

Table 4. 2: Demographic Characteristics of Respondents

The demographic data reveals a relatively balanced gender distribution, with males comprising 53.8% of respondents and females 46.2%. A significant proportion of respondents (37.5%) fell within the 30–40 age bracket, followed by those aged 20–30 years at 30.0%, highlighting a predominantly young teaching workforce. In terms of education, 55.0% of

respondents held qualifications at the diploma level or higher, reflecting a well-educated participant base. Teaching experience varied, with 45.0% having 6–10 years of experience, followed by 25.0% with over 10 years. These insights provide a comprehensive profile of the respondents, contextualizing the findings and their implications for ICT integration in public primary schools in Kyuso Sub-County.

4.4 Influence of ICT Integration in Lesson Preparation on Academic Performance in Public Primary Schools

The first objective of this study was to analyze the influence of ICT integration in lesson preparation on academic performance in public primary schools. Three indicators were used to assess this relationship: digital tools for sourcing lesson content, ICT-based structured lesson plans, and multimedia resources in lesson materials. The analysis for each indicator is presented below.

4.4.1 Digital Tools for Sourcing Lesson Content

This section examines the role of digital tools in sourcing lesson content, as illustrated in Figure 4.1. A total of 62% of respondents (32% strongly agree, 30% agree) affirmed frequent use of digital platforms in gathering instructional materials. This demonstrates a significant shift in pedagogical practices towards digitally mediated planning, particularly in response to resource constraints in rural schools. The trend aligns with Patel and Singh (2019), who found that digital platforms substantially improved the accessibility and relevance of lesson content. However, the 24% of teachers who remained neutral and the 14% who disagreed (6% strongly disagree, 8% disagree) suggest disparities in digital access or competence. This variation reflects Rogers' (2003) assertion that innovation diffusion occurs unevenly, influenced by access, training, and perceived ease of use.

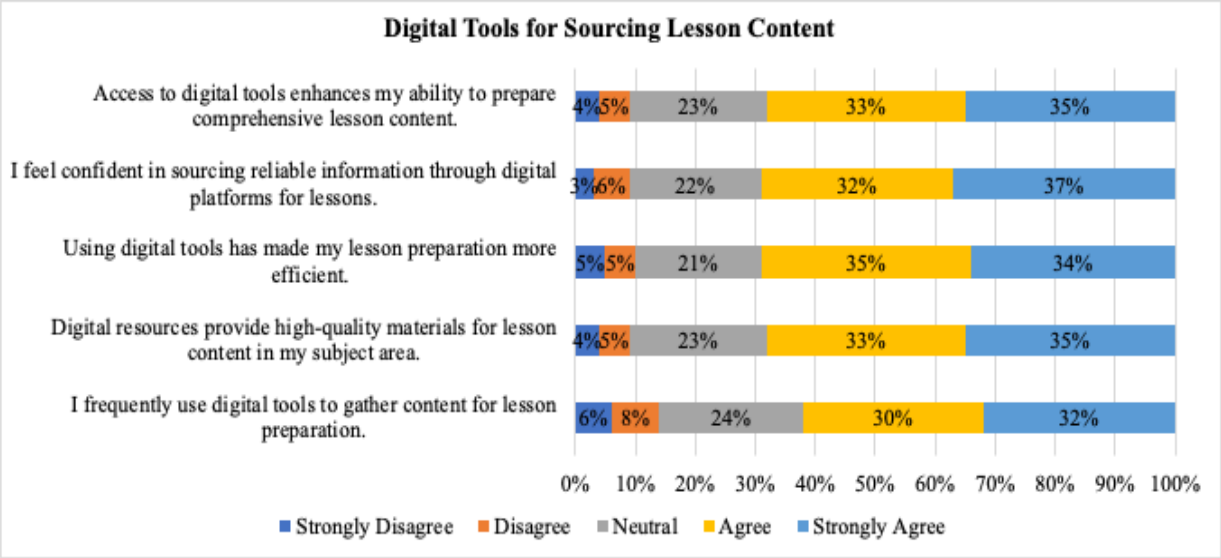

Figure 4. 1: Digital Tools for Sourcing Lesson Content

In addition, confidence in identifying credible online materials was high, with 69% (37% strongly agree, 32% agree) of respondents expressing trust in digital platforms. This illustrates growing teacher competence in digital navigation and information validation, a core requirement for effective ICT integration. Nevertheless, 22% expressed neutrality, while 9% expressed disagreement, implying ongoing gaps in digital literacy and critical evaluation skills. These findings echo Kim and Park (2020), who emphasized the critical role of digital literacy in enhancing content quality. In light of Vygotsky's (1978) Constructivist Learning Theory, these gaps underscore the need for professional scaffolding through structured ICT training and peer mentoring.

Equally significant is the finding that 69% of respondents (34% strongly agree, 35% agree) considered ICT tools as enablers of lesson preparation efficiency. This suggests that digital technologies are not only enhancing content depth but also optimising teacher workflow.

Tools such as templates, pre-curated lesson materials, and digital planners have likely contributed to these outcomes. This mirrors the findings of Otieno and Kamau (2021), who reported a substantial reduction in planning time among teachers using ICT. However, the 21% neutral and 4% disagreement responses highlight that efficiency gains are not uniformly experienced—likely due to limitations in technical know-how or inconsistent infrastructure.

Moreover, 68% of participants (35% strongly agree, 33% agree) reported that digital resources provide high-quality instructional materials. This high rating indicates confidence in the relevance, depth, and adaptability of digital resources, particularly in subject-specific content. Such perceptions are consistent with García and Sánchez (2021), who noted that digital tools enriched instructional delivery by enabling content differentiation. Yet, a noteworthy 23% remained neutral, and 7% (5% disagree, 2% strongly disagree) expressed dissatisfaction. These responses may reflect unmet needs in content localisation or limited access to curated digital repositories aligned with the national curriculum.

Finally, when asked whether digital access enhanced the comprehensiveness of their lesson content, 68% of teachers (35% strongly agree, 33% agree) responded affirmatively. This confirms the pedagogical value of ICT in enabling multimodal, inclusive, and comprehensive lesson design. Teachers using digital tools can incorporate videos, simulations, and interactive modules to cater to diverse learner needs. These findings affirm Kimani and Odhiambo's (2022) conclusion that ICT-based content contributes to higher academic performance and engagement. Still, 23% responded neutrally and 10% disagreed (6% disagree, 4% strongly disagree), pointing to infrastructural and capacity limitations that inhibit optimal integration. For such educators, targeted support is necessary to bridge the digital divide and promote full participation.

Theoretically, these findings are well aligned with both the Diffusion of Innovation Theory and the Constructivist Learning Theory. The former helps explain the progressive uptake of ICT tools, driven by perceived benefits and institutional influences (Rogers, 2003). Teachers who perceive ICT as advantageous and user-friendly are more likely to adopt and sustain its use. Simultaneously, the Constructivist perspective affirms that comprehensive and interactive digital content creates more dynamic, learner-centred experiences (Vygotsky, 1978). Together, these theories highlight the dual role of digital tools in lesson preparation—as both instruments of efficiency and enablers of pedagogical transformation.

4.4.2 ICT-Based Structured Lesson Plans

This section evaluates the influence of ICT-based structured lesson plans on academic performance, as illustrated in Figure 4.2. A total of 70% of respondents (36% strongly agree, 34% agree) affirmed that digital tools enhance their ability to structure lesson plans effectively. This strong endorsement suggests that ICT has become an indispensable element in instructional design, providing tools that support systematic, outcome-based planning. However, 22% remained neutral and 8% (5% disagree, 3% strongly disagree) expressed scepticism—possibly due to unfamiliarity with digital planning applications or limited access. These findings align with Mwangi and Njoroge (2021), who emphasized that ICT increases clarity and coherence in pedagogical preparation when users are properly trained and resourced.

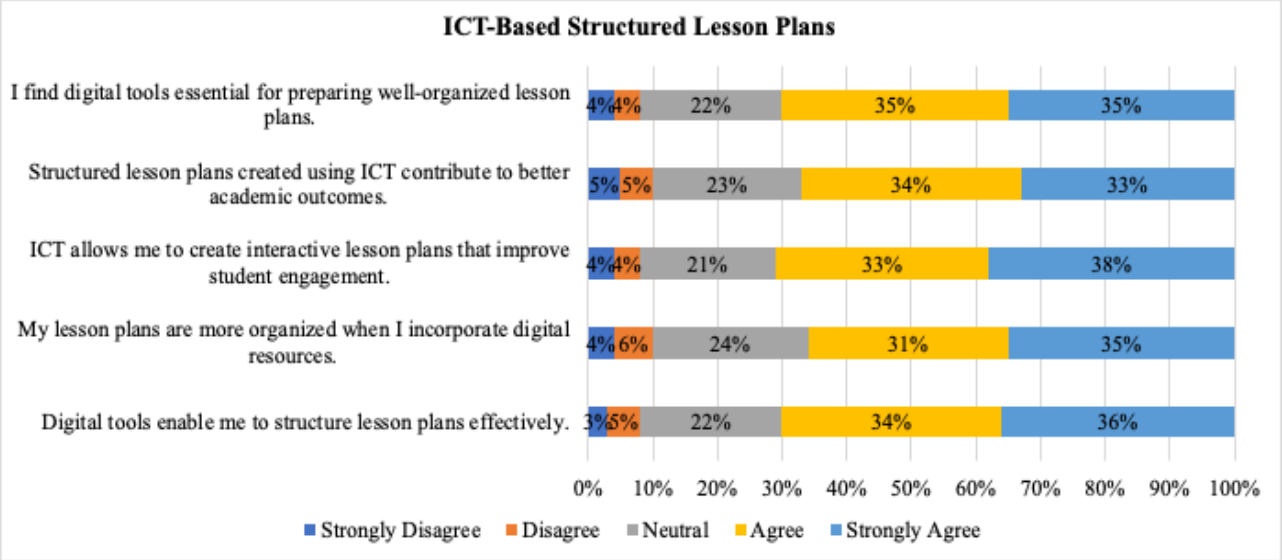

Figure 4. 2: ICT-Based Structured Lesson Plans

In addition, 66% of teachers (35% strongly agree, 31% agree) reported that their lesson plans were more organized when digital resources were incorporated. This affirms the value of ICT not only for content generation but for its organisational utility. Features such as scheduling templates, auto-formatting, and pre-loaded syllabus references contribute to enhanced planning precision. However, 24% of respondents were neutral and 10% (6% disagree, 4% strongly disagree) disagreed, potentially reflecting a mismatch between available tools and local curriculum demands. These results are consistent with García and Sánchez (2021), who found that teacher satisfaction with ICT's impact on planning correlates with both digital training and relevance of platform features.

Furthermore, 71% (38% strongly agree, 33% agree) of respondents confirmed that ICT enables them to create engaging and interactive lessons. This reveals a pedagogical shift toward constructivist approaches, where learners are placed at the centre through the use of digital animations, quizzes, simulations, and multimedia presentations. Only 21% remained neutral and 6% (4% disagree, 2% strongly disagree) disagreed, which may reflect teachers'

lack of exposure to advanced ICT functionalities or limitations in device availability. These observations are supported by Adjei and Boateng (2020), who demonstrated that interactivity in ICT-based lesson plans improved student participation and retention in Ghanaian classrooms. Vygotsky's Constructivist Learning Theory (1978) similarly suggests that such tools promote active learning and cognitive engagement.

Moreover, 67% of respondents (33% strongly agree, 34% agree) believed that structured lesson plans created through ICT contributed to better academic outcomes. This finding supports the notion that well-planned, digitally enhanced instruction leads to improved learning effectiveness by maintaining lesson flow and alignment with objectives. However, 23% were neutral and 10% (5% disagree, 5% strongly disagree) disagreed. This divergence may be explained by variations in digital competence, institutional support, or challenges in aligning digital resources with standardized assessments. Otieno and Kamau (2021) similarly reported that while ICT in planning enhances outcomes, its effectiveness hinges on contextual relevance and consistent use.

Finally, 70% of teachers (35% strongly agree, 35% agree) viewed digital tools as essential for preparing well-organized lesson plans, highlighting a growing pedagogical dependency on technology for structuring instruction. This widespread endorsement demonstrates how ICT can provide a scaffold for both novice and experienced teachers to streamline content delivery and focus more on learner engagement. However, the 22% who remained neutral and 8% (5% disagree, 3% strongly disagree) who rejected this view suggest an urgent need for differentiated professional development. Langat and Chebet (2021) similarly concluded that the success of ICT-integrated planning depends on building teacher capacity and aligning digital resources to classroom realities.

The theoretical relevance of these findings is twofold. First, according to the Diffusion of Innovation Theory (Rogers, 2003), teachers are more likely to adopt digital lesson planning tools when they perceive them as beneficial, easy to use, and compatible with their existing teaching methods. The high agreement levels reflect that many teachers have passed through early adoption phases and are now experiencing the observable benefits of ICT in instructional planning. Second, Constructivist Learning Theory supports the pedagogical value of ICT-enhanced plans, as they enable the creation of active, learner-centred environments. Interactive lesson plans allow students to engage in exploration, experimentation, and knowledge construction, all of which are foundational to meaningful learning.

4.4.3 Multimedia Resources in Lesson Materials

This section elaborates on the use of multimedia resources in lesson materials and their influence on academic performance, as illustrated in Figure 4.3.

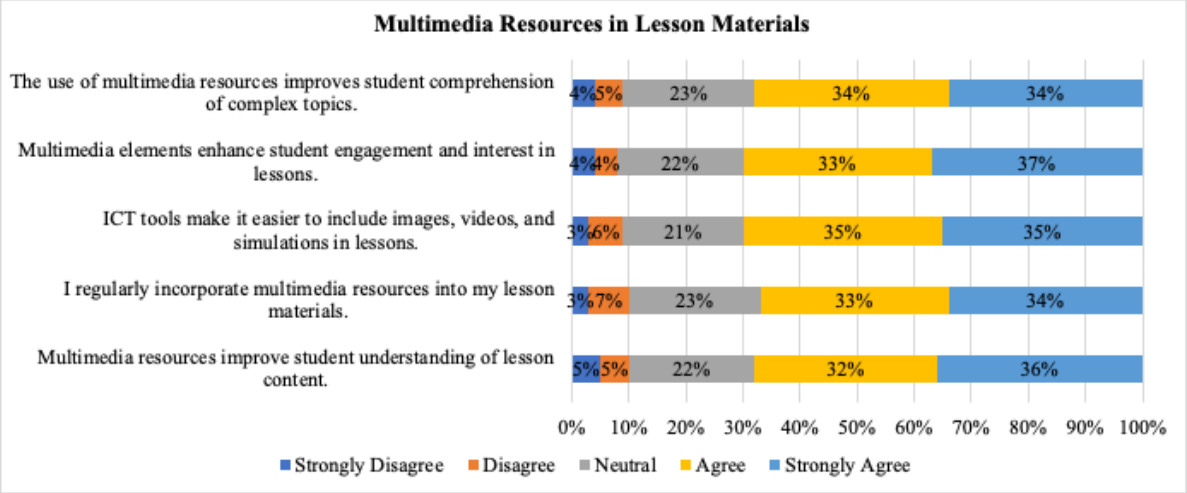

Figure 4. 3: Multimedia Resources in Lesson Materials

Regarding the statement *"Multimedia resources improve student understanding of lesson content,"* 68% of respondents (34% strongly agree, 34% agree) expressed positive views.

This suggests a growing appreciation of multimedia as a tool to enhance conceptual clarity, especially for abstract or complex subjects. Teachers likely leverage videos, infographics, animations, and simulations to illustrate ideas, fostering visual and auditory learning pathways. However, 23% were neutral and 9% (5% disagree, 4% strongly disagree) held reservations—potentially due to limited digital fluency or insufficient access to high-quality multimedia content. These insights reflect findings by Kim and Park (2019), who documented a 30% improvement in student performance when multimedia was used in classrooms.

In addition, a total of 67% of respondents (33% agree, 34% strongly agree) confirmed they regularly incorporate multimedia into lesson materials. This consistent integration indicates a pedagogical shift toward more interactive and inclusive content design. Still, 23% were neutral and 10% (6% disagree, 4% strongly disagree) reported infrequent or no use, likely due to infrastructure challenges such as lack of electricity, projectors, or internet access. This aligns with Mwangi and Njoroge (2021), who noted that despite teacher willingness, many rural schools in Kenya lack the resources to fully operationalize ICT-enhanced lesson delivery.

Moreover, 70% of teachers (35% strongly agree, 35% agree) agreed that these tools make it easier to include images, videos, and simulations in lessons. This high level of agreement reflects the practical value teachers derive from digital platforms that simplify multimedia embedding, reduce formatting tasks, and support real-time content access. Nevertheless, 21% were neutral and 9% (5% disagree, 4% strongly disagree) expressed concerns—possibly related to software limitations, lack of training, or poor device compatibility. Adjei and Boateng (2020) similarly observed that while ICT can personalize and enrich instruction, its

success depends heavily on both the teacher's technical capacity and the reliability of supporting infrastructure.

Similarly, a substantial 70% of teachers (37% strongly agree, 33% agree) affirmed that multimedia enhances student engagement and interest in lessons. This finding suggests that students respond positively to visual and interactive elements that break the monotony of text-heavy instruction. Interactive multimedia—such as animations, storytelling videos, or gamified exercises—can help sustain attention and stimulate participation, particularly among learners with short attention spans or reading challenges. However, 21% were neutral and 9% (5% disagree, 4% strongly disagree) may reflect scepticism regarding its consistent impact or their own ability to use these tools effectively. These insights align with García and Sánchez (2021), who concluded that multimedia materials improve student attentiveness and learning outcomes when thoughtfully integrated.

Finally, in evaluating the role of multimedia in facilitating comprehension of complex topics, 68% of respondents (34% strongly agree, 34% agree) agreed that such resources are effective. This reinforces the perception that multimedia offers layered representations of knowledge, enabling deeper learning through audio-visual explanations. Yet, the 22% neutral and 10% disagreeing responses (6% disagree, 4% strongly disagree) highlight systemic constraints such as inadequate access to devices or teacher reluctance due to unfamiliarity with multimedia editing or sourcing. Otieno and Kamau (2021) found similar patterns, noting that multimedia use significantly improved understanding in STEM subjects, but adoption was uneven in poorly equipped schools.

The findings are strongly supported by the Diffusion of Innovation Theory (Rogers, 2003), which posits that the adoption of innovations like multimedia depends on observable benefits, ease of use, and institutional support. Teachers who perceive positive outcomes—such as improved engagement or comprehension—are more likely to embed multimedia consistently in their teaching. At the same time, Constructivist Learning Theory affirms the value of multimedia in fostering student-centred learning. By using multimedia, teachers create environments where learners can interact with content in multiple formats, construct meaning through experience, and engage in reflective thinking (Vygotsky, 1978).

4.5 Influence of ICT Integration in Classroom Teaching on Academic Performance in Public Primary Schools.

The second objective of this study was to evaluate the influence of ICT integration in classroom teaching on academic performance in public primary schools. Three indicators were used for the analysis: the frequency of interactive technology use, real-time digital lesson adaptation, and ICT for tracking student participation. Each indicator and its findings are presented and discussed below.

4.5.1 Frequency of Interactive Technology Use

This section explores the use of ICT tools to track student participation and monitor engagement during lessons. The findings are as depicted in Figure 4.4.

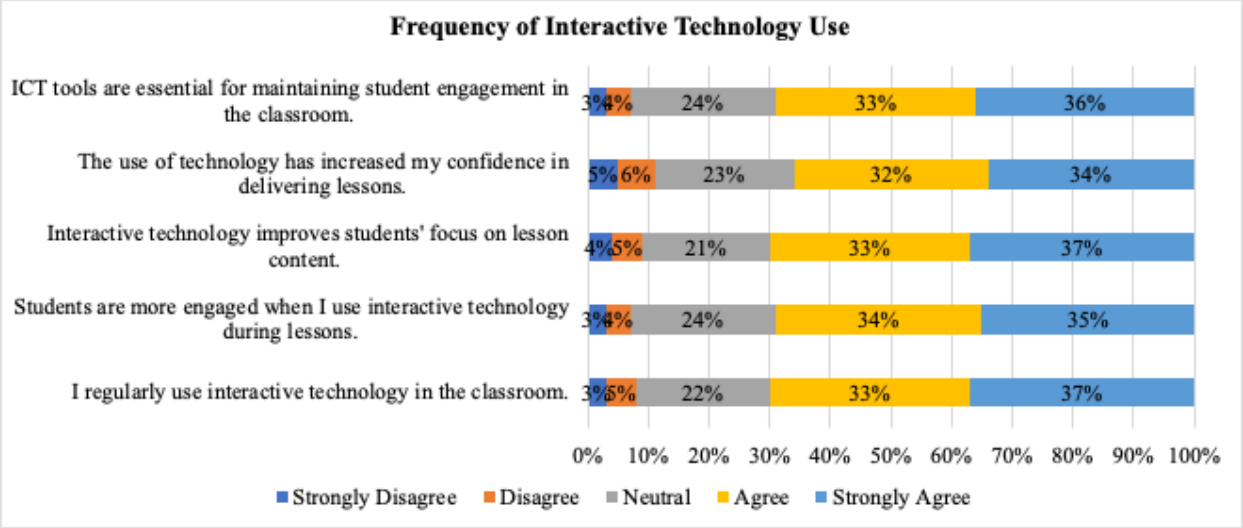

Figure 4. 4: Frequency of Interactive Technology Use

A combined 70% of respondents (37% strongly agree, 33% agree) indicated that they regularly use interactive technologies in their teaching, reflecting a strong endorsement of digital tools as integral to 21st-century pedagogy. This high rate of use demonstrates that interactive technologies have become embedded in the instructional practices of many teachers in Kyuso Sub-County. These tools likely include visual aids, polling applications, and multimedia simulations, which can enrich lesson delivery and foster student engagement. However, the 22% who remained neutral and the 8% who disagreed (5% disagree, 3% strongly disagree) reveal that this trend is not universal. This divergence may result from unequal access to technology, limited training, or infrastructural challenges that inhibit consistent implementation across schools. These patterns reflect the findings of Mwangi and Ochieng (2022), who identified access disparities and digital competency gaps as persistent barriers to full ICT integration in Kenyan primary schools.

Furthermore, 69% of teachers (35% strongly agree, 34% agree) affirmed that student engagement increases when interactive technology is employed. This finding aligns with global research showing that digital tools make learning environments more participatory and

engaging, particularly through multimedia formats that appeal to various learning styles. ICT tools can also gamify learning, offer immediate feedback, and enhance visual representation of complex concepts, thereby capturing learners' attention more effectively than traditional approaches. Nevertheless, the 20% neutral and 11% disagreement responses may signal uncertainty or inconsistency in the perceived impact of these tools, possibly due to varying student responses, classroom sizes, or the teachers' proficiency with the technology. Garcia and Lopez (2021) similarly observed that while ICT significantly improves engagement, its success depends heavily on the quality of integration and teacher facilitation.

The belief that interactive technology improves students' focus on lesson content was endorsed by 70% of respondents (37% strongly agree, 33% agree), reinforcing the idea that ICT does more than attract attention—it sustains it. Digital tools such as real-time quizzes and collaborative platforms help maintain instructional flow and reduce distractions by keeping learners actively involved. However, 21% of respondents remained neutral and 9% disagreed, suggesting a group of educators who may not have experienced such outcomes, perhaps due to environmental factors like classroom overcrowding or tool limitations. This is consistent with Maseko et al. (2022), who noted that while interactive tools improved attentiveness in well-resourced contexts, under-resourced classrooms saw minimal benefit due to logistical constraints.

Regarding instructional confidence, 66% of teachers (34% strongly agree, 32% agree) reported feeling more confident in delivering lessons with the support of technology. This sense of empowerment may stem from the ease of accessing teaching materials, managing class activities, and evaluating student responses in real time. For many educators, technology

offers a structured and supportive framework for delivering lessons effectively. However, 29% of teachers responded neutrally or disagreed, highlighting that confidence is not universally improved by ICT; in fact, some may feel overwhelmed by the demands of learning and integrating new technologies. Adjei and Boateng (2020) emphasized that confidence in ICT use grows with familiarity and institutional backing, suggesting a need for ongoing professional development to bridge this gap.

Lastly, the assertion that ICT tools are essential for maintaining student engagement received support from 69% of teachers (36% strongly agree, 33% agree), underscoring the centrality of technology in promoting learner participation and attention. Engagement in this context includes cognitive, emotional, and behavioural dimensions, all of which are supported by interactive tools that provide immediate reinforcement and promote collaborative learning. Despite this, 24% of respondents were neutral and 7% disagreed, implying that for a portion of teachers, engagement remains a challenge irrespective of technology use—perhaps due to ineffective pedagogical approaches or a mismatch between tool design and learner needs. Tesha and Ngowi (2020) similarly highlighted that ICT must be complemented with sound instructional strategies to yield meaningful engagement.

These findings resonate strongly with Constructivist Learning Theory, which advocates for active, learner-centred environments in which students build understanding through experience and interaction. Interactive technologies support this by facilitating exploration, problem-solving, and collaborative learning. From the lens of the Diffusion of Innovation Theory, the adoption of interactive tools appears to be influenced by teachers' perceptions of their relative advantage, ease of use, and compatibility with their teaching styles. Those who

perceive ICT as both beneficial and manageable are more likely to integrate it into their routines, while others remain hesitant due to perceived complexity or lack of support. These theoretical frameworks jointly reinforce the need for targeted interventions to ensure that all educators can harness the transformative power of interactive technologies.

4.5.2 Real-Time Digital Lesson Adaptation

This section evaluates the extent to which teachers use ICT tools to adapt lesson content in real time based on student responses and emerging needs, as illustrated in Figure 4.5.

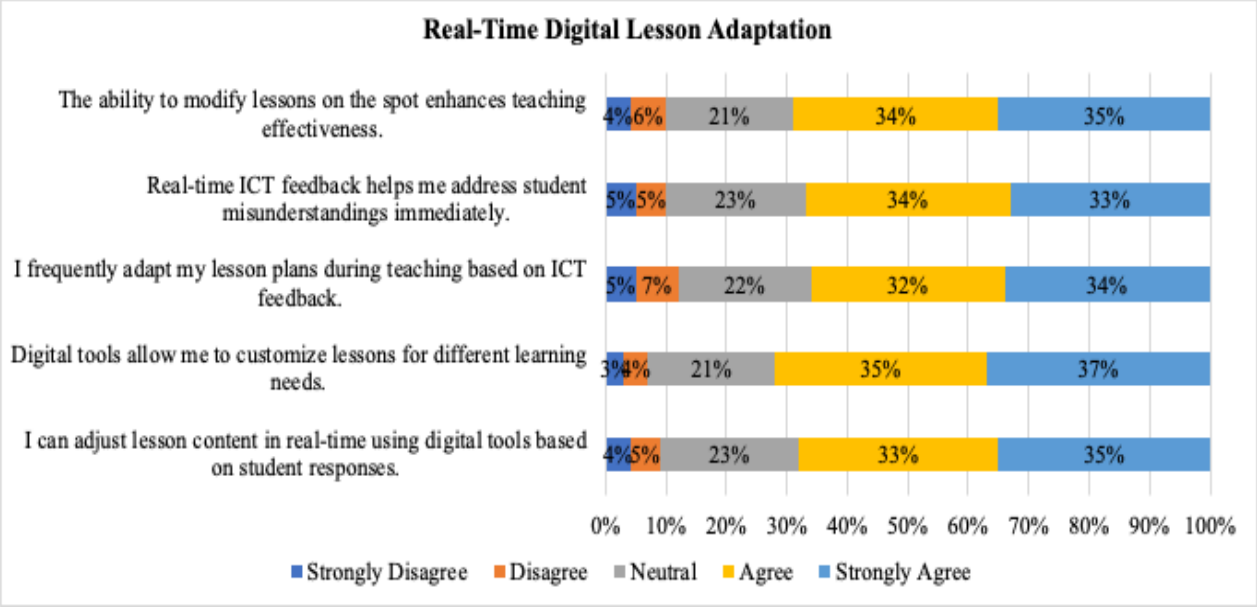

Figure 4. 5: Real-Time Digital Lesson Adaptation

A significant proportion of respondents (68%)—comprising 35% who strongly agreed and 33% who agreed—reported that they are able to dynamically adjust lesson content using digital tools during instruction. This suggests that many teachers are leveraging the flexibility of ICT to tailor learning experiences based on real-time classroom feedback. Such adaptability is critical in ensuring that teaching remains responsive, especially when addressing emerging misconceptions or reinforcing key concepts. However, the 23% who responded neutrally and

the 9% who disagreed or strongly disagreed reflect that this capacity is not yet universal. These teachers may lack the necessary ICT tools, training in real-time pedagogical agility, or access to platforms that support responsive content modification. As noted by Mutua and Njoroge (2020), the ability to adapt lessons during instruction significantly enhances teaching effectiveness, particularly when supported by institutional investment in technology infrastructure and teacher capacity-building.

Additionally, 72% of respondents (37% strongly agree, 35% agree) indicated that digital tools allow them to customize lessons to meet different learning needs, reaffirming ICT's role in promoting differentiated instruction. Such tools enable teachers to provide alternative explanations, varied content formats, and task adjustments that accommodate students with diverse abilities and learning styles. This customization is essential for inclusive education, especially in large, mixed-ability classrooms common in public primary schools. Despite these positive reports, 19% of teachers remained neutral, and 9% disagreed or strongly disagreed, suggesting either limited exposure to ICT-enabled differentiation strategies or challenges in operationalizing such adaptations during regular classroom sessions. Tesha and Lema (2023) reported similar findings in Tanzanian schools, highlighting that while digital customization tools are beneficial, their use is constrained by teachers' digital proficiency and availability of appropriate content.

Moreover, 66% of teachers (34% strongly agree, 32% agree) reported that they frequently adapt lesson plans during teaching based on ICT feedback. This reflects a growing shift toward data-informed pedagogy, where teaching strategies are not fixed but evolve in response to real-time learner input. ICT tools such as learning management systems, polling

applications, and digital quizzes offer immediate insights into students' understanding, allowing teachers to pivot instruction accordingly. However, the 22% neutral responses and the 12% who disagreed point to uneven usage of these feedback mechanisms. In many cases, the feedback may be available, but teachers may lack the training or time to interpret and act upon it effectively. García and Sánchez (2021) emphasized that to maximize the benefits of real-time feedback, teachers must be supported with ongoing digital pedagogy training and simplified data analytics tools.

The value of real-time ICT feedback in addressing student misunderstandings was confirmed by 67% of respondents (33% strongly agree, 34% agree). This indicates a strong endorsement of ICT as a formative assessment tool that enables immediate correction and reinforcement. Addressing misconceptions as they arise is a hallmark of effective teaching, as it prevents the accumulation of learning gaps and maintains learner confidence. Nonetheless, 21% of teachers responded neutrally and 12% expressed disagreement, again pointing to gaps in access or ability to use feedback platforms optimally. Mwangi and Njoroge (2021) observed that even in schools with ICT infrastructure, underutilization of real-time feedback systems was common, primarily due to lack of practical training on integrating feedback into instructional routines.

Furthermore, the ability to modify lessons on the spot was considered a major strength of ICT by 69% of respondents (35% strongly agree, 34% agree). Teachers who can make spontaneous adjustments can better respond to classroom dynamics, student interest levels, and time constraints. This instructional flexibility enhances both engagement and content relevance, leading to more meaningful learning experiences. However, 23% of participants

remained neutral, and 8% disagreed with the statement, suggesting that real-time adaptation is not consistently practiced. This may be attributed to rigid lesson structures, fear of deviating from set plans, or discomfort with using technology in unplanned ways. Ochieng and Mwenda (2023) noted that while adaptive teaching via ICT is effective, it requires a mindset shift and administrative support that encourages innovation rather than strict adherence to scripted instruction.

The above findings are strongly grounded in the Diffusion of Innovation Theory, which emphasizes that the uptake of new practices such as ICT-supported lesson adaptation is influenced by perceived benefits, ease of use, and compatibility with existing practices. Teachers who have experienced the benefits of real-time digital responsiveness are more likely to become early adopters and advocates of ICT in instruction. At the same time, Constructivist Learning Theory offers a pedagogical rationale for these practices, proposing that meaningful learning occurs when instruction is responsive, interactive, and adapted to the learner's evolving needs. Real-time digital tools enable such learning environments by promoting dialogue, reflection, and immediate feedback—all of which are essential for constructing knowledge collaboratively and contextually.

4.5.3 ICT For Tracking Student Participation

This section explores the role of ICT in tracking student participation during lessons and its impact on academic performance, as illustrated in Figure 4.6.

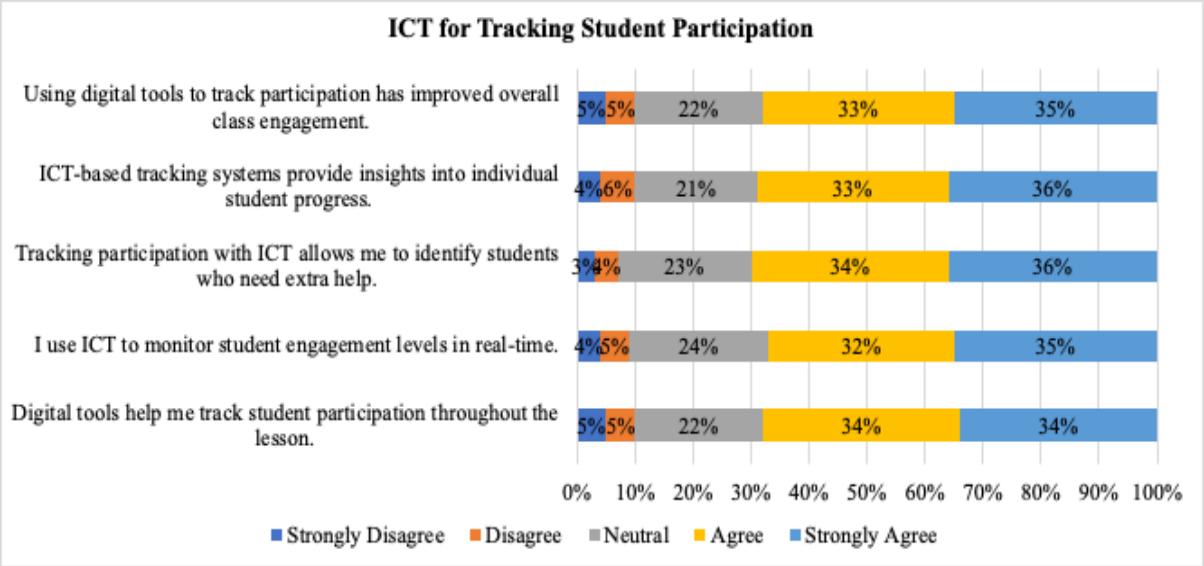

Figure 4. 6: ICT for Tracking Student Participation

A total of 68% of respondents (34% strongly agree, 34% agree) confirmed that digital tools help them track student participation throughout the lesson. This result affirms that ICT is not only valued for content delivery but also for its utility in facilitating classroom management and learner engagement. These tools likely include attendance trackers, real-time response systems, and student activity dashboards, which provide teachers with immediate insights into who is participating and who is disengaged. However, 22% of teachers responded neutrally and 10% disagreed (5% disagree, 5% strongly disagree), indicating that while ICT tracking is gaining traction, some educators are not yet fully leveraging or accessing these functionalities. The disparity may be attributed to uneven distribution of digital infrastructure across schools, as well as differences in individual teacher readiness. Maseko and Sibanda (2022) similarly found that although participation tracking tools improved engagement in South African classrooms, limited infrastructure and ICT skills restricted their impact in underserved areas.

Similarly, 67% of teachers (35% strongly agree, 32% agree) reported using ICT to monitor student engagement levels in real time. This capability allows teachers to assess attention

levels and adapt instruction to sustain focus, which is especially important in large or mixed-ability classrooms. Real-time monitoring can involve using digital platforms that capture live interactions, such as responses to polls, activity logs, or time spent on tasks. Nonetheless, 23% of respondents expressed neutrality and 10% disagreed with this statement, suggesting that some teachers may not be using these features regularly or effectively. This may be due to a lack of familiarity with available platforms or uncertainty about how to interpret and respond to real-time data. Adjei and Mensah (2020) reported similar patterns in Ghana, where real-time monitoring tools were praised in theory but underutilized in practice due to gaps in training and institutional support.

The potential of ICT to support targeted intervention was affirmed by 70% of respondents (36% strongly agree, 34% agree), who indicated that tracking participation helps them identify students in need of additional support. This feedback mechanism enables early intervention and personalization of learning pathways, thereby supporting equity in instruction. Teachers can flag passive learners or those showing signs of confusion, and respond with follow-up questions, peer support strategies, or differentiated tasks. However, 20% of teachers remained neutral and 10% disagreed, which may reflect concerns about data accuracy or the time required to act on insights during live instruction. These findings echo those of Tesha and Ngowi (2020), who observed that while ICT-supported tracking improved intervention outcomes, many teachers struggled to balance instructional demands with data interpretation in real time.

The role of ICT in tracking individual student progress was also affirmed by 69% of respondents (36% strongly agree, 33% agree), indicating widespread appreciation for data analytics features embedded in digital learning platforms. These tools can help track a

student's performance over time, monitor mastery of learning objectives, and identify learning gaps. By making performance trends visible, ICT empowers teachers to adopt evidence-based practices and support learning outcomes more effectively. Nonetheless, 22% of respondents were neutral and 9% disagreed, indicating that some educators may find these systems complex, unreliable, or misaligned with the curriculum. According to Mwangi and Njoroge (2021), these barriers can be addressed through targeted capacity-building initiatives and the provision of user-friendly tracking platforms tailored to the local educational context.

Finally, 68% of teachers (35% agree, 33% strongly agree) agreed that using digital tools to track participation has improved overall class engagement. This suggests that students respond positively when they are aware their participation is being monitored, leading to greater attentiveness and interaction during lessons. When properly implemented, ICT tracking systems can enhance accountability, ensure equitable participation, and foster a classroom culture where all students are encouraged to contribute. However, 24% of teachers were neutral and 8% disagreed with the statement, which may reflect either philosophical differences regarding student monitoring or practical limitations such as a lack of time, technical support, or student device availability. Ochieng and Mwenda (2023) found that while ICT-enabled tracking increased engagement and performance, its success was contingent upon school-wide integration and consistent usage.

The findings in this section align closely with the principles of Constructivist Learning Theory, which emphasizes the importance of creating interactive, responsive, and student-centred learning environments. Tracking participation ensures that all learners are actively involved, allows teachers to respond to emerging learning needs, and supports reflective teaching practices. From a theoretical standpoint, the use of ICT for tracking engagement

transforms the classroom from a teacher-led space to a collaborative learning environment where each student's voice is visible and valued. At the same time, the Diffusion of Innovation Theory offers a useful framework for interpreting the uneven adoption of participation-tracking tools. Teachers who observe clear benefits in classroom engagement and instructional efficiency are more likely to continue and expand their use of these technologies, while those who perceive the tools as burdensome or ineffective may resist adoption without targeted support.

4.6 Influence of ICT Integration in Revisions and Private Studies on Academic Performance in Public Primary Schools

The third objective of this study explored the influence of ICT integration in revisions and private studies on academic performance in public primary schools. The analysis focused on three indicators: access to online study resources, ICT use for practice tests and quizzes, and ICT for personalized learning plans. Each indicator and its findings are presented and discussed below.

4.6.1 Access to Online Study Resources

This section explored the availability of online study resources and their impact on student academic outcomes. The results are as presented in Figure 4.7.

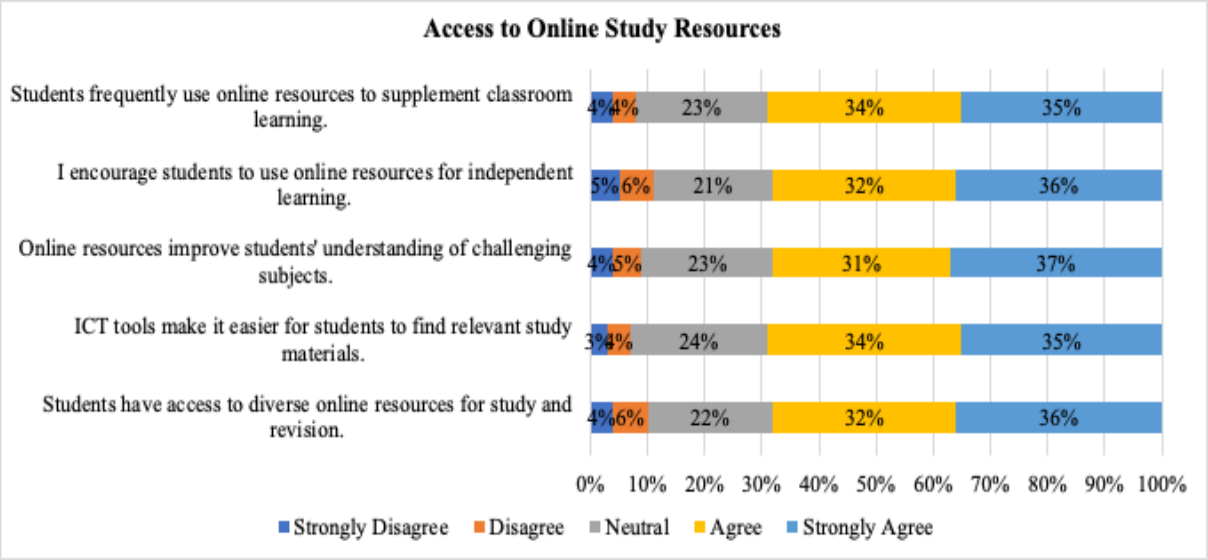

Figure 4. 7: Access to Online Study Resources

A combined 68% of respondents (36% strongly agree, 32% agree) indicated that students have access to a variety of online study resources to support revision. This reflects a progressive shift in educational environments, where ICT is increasingly filling the gaps left by limited textbooks and physical teaching materials, especially in rural or under-resourced contexts. Online platforms provide current, interactive, and diversified content that caters to different subject areas and cognitive levels, helping students reinforce what they have learned in class. However, the 22% of teachers who responded neutrally and the 10% who disagreed or strongly disagreed may be pointing to inequalities in digital infrastructure or a lack of guidance on how to navigate these online platforms effectively. These observations align with the work of Mutua and Njoroge (2020), who found that access to structured digital content enhanced learning outcomes, especially in complex subjects such as mathematics and science.

In addition, 69% of respondents (35% strongly agree, 34% agree) acknowledged that ICT tools simplify the process of locating relevant study materials. Digital tools, such as educational search engines and resource libraries, allow students to retrieve targeted content

more efficiently than traditional methods. This convenience promotes independent study and supports personalized learning pathways. However, 24% of respondents were neutral, suggesting that despite the presence of digital tools, some students may lack the skills or confidence to find and assess appropriate content. Barriers such as digital literacy, low internet bandwidth, or lack of school-level training sessions could hinder the effective use of these resources. Kimani and Wanjiku (2022) reported that structured guidance significantly improved outcomes, with learners in Kisumu County recording a 22% gain in literacy scores when they had regular access to and support in using ICT resources.

The role of online resources in improving comprehension of difficult subjects was supported by 68% of teachers (37% strongly agree, 31% agree). This indicates that digital content is not just supplementary, but often central to learning, particularly in subjects with abstract or technical content. Multimedia tools such as educational animations, simulations, and video lessons allow complex concepts to be visualised and broken down for easier understanding. Nevertheless, 23% were neutral and 9% disagreed or strongly disagreed. These responses may reflect issues of limited access, language barriers, or a lack of alignment between online materials and the local curriculum. Tesha and Lema (2023) similarly observed that although digital content improved comprehension in Tanzanian classrooms, its integration was limited by infrastructure challenges and the absence of curriculum-mapped resources.

Furthermore, 68% of teachers (36% strongly agree, 32% agree) stated that they actively encourage students to use online resources for independent learning. This reflects a growing pedagogical focus on fostering student autonomy and critical thinking. Encouragement from teachers can positively influence learners' attitudes toward ICT, helping them develop digital

study habits that are essential for lifelong learning. However, 27% of respondents were neutral or disagreed, raising questions about the consistency of teacher engagement in this domain. Some educators may feel underprepared or lack confidence in recommending specific online platforms. Mwangi and Odhiambo (2021) underscored the importance of teacher involvement in guiding learners through digital landscapes, noting a direct correlation between teacher encouragement and improved academic independence among students.

Finally, 69% of respondents (35% strongly agree, 34% agree) indicated that students frequently use online resources to supplement classroom learning. This finding confirms that ICT tools are not only teacher-led interventions but are increasingly becoming part of students' own learning routines. Digital access allows students to revisit material at their own pace, clarify concepts they find difficult, and explore content beyond the syllabus. However, 23% were neutral and 8% disagreed or strongly disagreed, suggesting that use may be uneven across schools or student groups. Ochieng and Mwenda (2023) highlighted similar patterns in rural Kenya, noting that students in ICT-rich schools were more engaged and performed better on assessments due to their ability to revise with online tools.

These findings are strongly supported by the Constructivist Learning Theory, which holds that students learn best when they actively construct knowledge through exploration and meaningful engagement with content. ICT enables this by offering access to diverse and interactive resources that support learner autonomy. Simultaneously, the Diffusion of Innovation Theory helps explain the variation in adoption and usage patterns. Teachers and students who perceive online resources as useful and accessible are more likely to embrace them, while others may hesitate due to perceived complexity, lack of support, or limited

exposure. Together, these frameworks demonstrate that online study resources can significantly transform student learning, provided that equitable access and appropriate support mechanisms are in place.

4.6.2 ICT Use for Practice Tests and Quizzes

This section evaluates the impact of ICT tools used for administering practice tests and quizzes on students' academic performance. The results are presented in Figure 4.8.

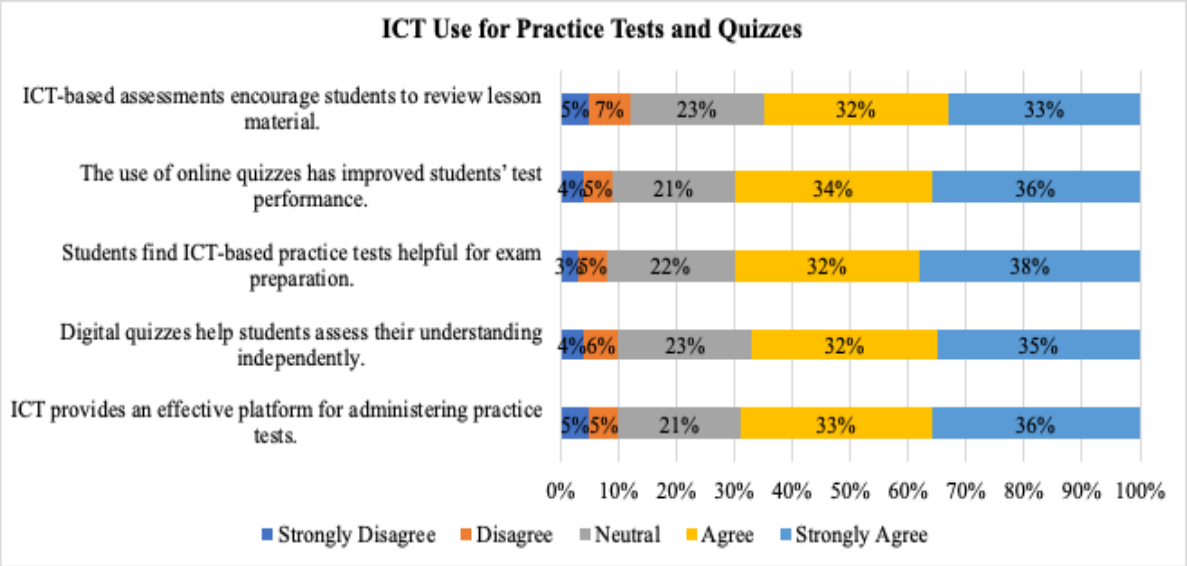

Figure 4. 8: ICT Use for Practice Tests and Quizzes

The findings reveal that 69% of respondents (36% strongly agree, 33% agree) believe that ICT provides an effective platform for administering practice tests. This high level of agreement reflects the growing recognition of digital assessments as a valuable component of the learning process. ICT platforms enable efficient administration of quizzes, automated grading, and instantaneous feedback, helping students independently assess their understanding of various subjects. These tools support both teachers and learners by offering structured revision opportunities and reducing reliance on manual assessment methods.

However, 21% of teachers responded neutrally, while 10% disagreed or strongly disagreed. This variation may be attributed to inconsistent access to digital tools, varying levels of ICT competence among educators, or challenges in designing assessments that align with the curriculum. Similar findings were noted by Mutua and Njoroge (2020), who observed that while digital assessment tools improved student engagement and achievement in Nairobi, their integration was largely dependent on training and infrastructure.

Additionally, 67% of respondents (35% strongly agree, 32% agree) affirmed that digital quizzes support independent learning by helping students evaluate their understanding autonomously. This finding emphasizes ICT's role in promoting metacognitive skills such as self-monitoring, reflection, and personal goal-setting. Learners can track their progress, revisit incorrect responses, and identify concepts that require additional attention. However, 23% of the respondents were neutral and 10% disagreed, which may point to limited exposure to these platforms or insufficient encouragement from teachers to utilize them effectively. Kimani and Wanjiku (2022) highlighted that guided use of digital quizzes helped students develop academic independence and improved their confidence, especially in subjects with high cognitive demands.

The effectiveness of ICT-based practice tests for exam preparation was endorsed by 70% of respondents (38% strongly agree, 32% agree), indicating that teachers find these tools valuable in helping students build test-taking skills and reinforce classroom instruction. These platforms provide varied question formats, repetition opportunities, and adaptive difficulty levels, all of which contribute to comprehensive exam readiness. However, the 20% neutral and 10% disagreeing responses imply a gap in usage or alignment between ICT tools and local syllabi. Ochieng and Mwenda (2023) documented a 25% improvement in mock exam

scores in schools where ICT-based quizzes were integrated into structured revision programs, reinforcing their relevance in preparing students for high-stakes assessments.

Furthermore, 70% of respondents (36% strongly agree, 34% agree) reported that online quizzes had a direct positive impact on students' test performance. This highlights the dual role of ICT-based assessments in both formative and summative learning. Instant feedback helps learners to correct misunderstandings in real time and consolidate new knowledge. Yet, 21% of respondents were neutral, while 9% expressed disagreement, possibly indicating inconsistent follow-up or limited student engagement with the feedback process. Tesha and Ngowi (2020) stressed the importance of teacher facilitation and post-quiz reflection in maximizing the learning potential of digital assessments.

Lastly, 65% of respondents (33% agree, 32% strongly agree) indicated that digital quizzes encourage regular content review among students. This suggests that ICT plays a role in fostering disciplined revision habits and maintaining knowledge retention. Interactive features such as progress tracking, gamification, and adaptive sequencing may further motivate students to engage more frequently with content. However, 23% of respondents were neutral and 12% disagreed, highlighting that not all learners perceive digital assessments as essential to their study routines. Mwangi and Odhiambo (2021) found that where ICT-based quizzes were embedded in lesson plans and accompanied by teacher reinforcement, students were more likely to engage consistently and show academic gains.

The findings align well with Constructivist Learning Theory, which posits that learners construct knowledge actively through interaction, reflection, and feedback. ICT-based practice tests support this by offering personalized, interactive learning experiences where

students can take ownership of their academic progress. These tools foster self-directed learning and provide immediate insights that help students shape their understanding. Simultaneously, the Diffusion of Innovation Theory helps to explain variations in adoption, where teachers who perceive ICT-based assessments as effective and compatible with their instructional approaches are more likely to integrate them consistently. These theoretical perspectives reinforce the role of digital quizzes in supporting student-centred learning and assessment.

4.6.3 ICT for Personalized Learning Plans

This section explores how ICT tools enable the creation and monitoring of personalized learning plans, contributing to individual academic growth and overall performance. The findings are as presented in Figure 4.9.

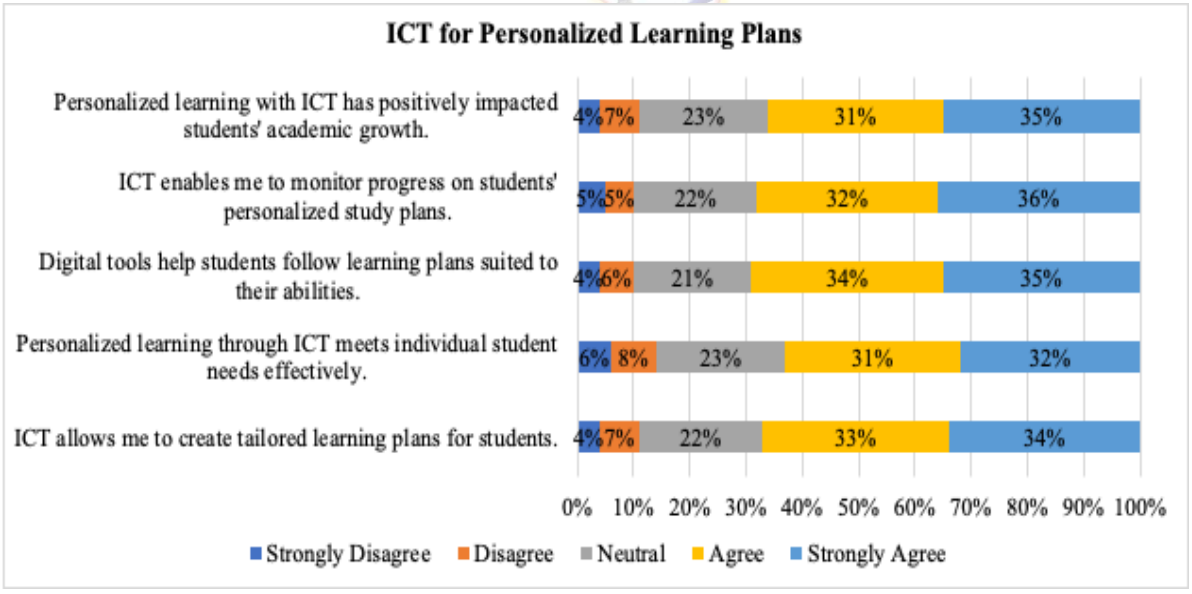

Figure 4. 9: ICT for Personalized Learning Plans

The findings indicate that 67% of respondents (34% agree, 33% strongly agree) believe that ICT enables the creation of personalized learning plans tailored to the individual needs of

students. This strong endorsement highlights the potential of digital platforms in supporting differentiated instruction by allowing teachers to design adaptive content, set individual goals, and monitor learning trajectories. Personalized learning is particularly valuable in large and diverse classrooms where students have varying abilities, learning paces, and support needs. However, 22% of respondents were neutral and 11% disagreed, indicating that a significant proportion of educators may lack access to digital tools or the pedagogical skills necessary to create individualized plans. Mutua and Njoroge (2020) similarly found that while personalized ICT strategies yielded positive academic outcomes in Nairobi County schools, their successful implementation required both infrastructure and continuous teacher training.

Moreover, 63% of teachers (32% strongly agree, 31% agree) affirmed that personalized learning through ICT meets individual student needs effectively. This finding underscores the role of digital learning environments in accommodating diverse learning styles, cognitive levels, and motivational factors. For example, struggling learners can benefit from simplified content, visual aids, and repetitive tasks, while advanced students can access enrichment materials that extend their understanding. However, 23% of teachers responded neutrally, and 14% disagreed, possibly due to challenges in selecting or curating suitable digital resources, or in monitoring multiple learning pathways simultaneously. Mwangi and Odhiambo (2021) emphasized that effective personalized learning is not merely about providing ICT access but also about equipping educators with the digital pedagogical skills needed to support and sustain individualized learning plans.

In addition, 69% of respondents (35% strongly agree, 34% agree) stated that ICT helps students follow learning plans that are aligned with their academic abilities. This suggests that digital tools enhance student autonomy by offering structured guidance and real-time

feedback through progress trackers, goal-setting features, and adaptive activities. Such tools enable learners to monitor their own development and take greater ownership of their educational journey. Despite this positive perception, 21% of teachers were neutral and 10% disagreed, which may indicate that while the tools exist, their use is not always effectively integrated into daily classroom practice. Kimani and Wanjiku (2022) observed that consistent engagement with digital study planners was linked to improved academic performance, but only when teachers actively monitored student progress and reinforced learning targets.

A further 68% of respondents (36% strongly agree, 32% agree) reported that ICT enables them to monitor student progress on personalized study plans. This finding confirms that teachers value ICT for its ability to provide real-time, data-driven insights into student achievement. Digital dashboards, performance analytics, and automated alerts allow educators to identify learning gaps early and adjust strategies accordingly. However, the 22% who were neutral and the 10% who disagreed suggest that some teachers may not be fully utilizing these monitoring tools, either due to limited training, poor system usability, or time constraints. Tesha and Ngowi (2020) similarly highlighted that while ICT enhanced progress tracking in Tanzanian classrooms, sustained impact required structured data interpretation support and regular teacher engagement.

Finally, 66% of teachers (35% strongly agree, 31% agree) agreed that personalized learning supported by ICT positively impacts student academic growth. This reinforces the notion that individualized learning environments foster deeper engagement, improved retention, and higher achievement. When students receive content aligned with their interests, abilities, and learning goals, they are more motivated to learn and more likely to succeed academically. However, the 23% neutral and 11% disagreeing responses reveal that some teachers remain

uncertain about the direct link between personalization and performance. This may reflect implementation challenges such as platform limitations, heavy teaching workloads, or a lack of observable short-term gains. Ochieng and Mwenda (2023) emphasized the importance of continuous professional development and collaborative planning in maximizing the effectiveness of ICT-based personalized learning strategies.

The findings from this section align strongly with Constructivist Learning Theory, which promotes the view that learners construct knowledge most effectively when they are active participants in a process that respects their individual needs and interests. ICT facilitates this by enabling student-centred learning environments that allow for personal exploration, scaffolding, and progress at one's own pace. These environments promote autonomy and critical thinking, encouraging students to take initiative and assume responsibility for their learning. Additionally, the Diffusion of Innovation Theory helps explain the varying levels of adoption observed among teachers. Those who perceive clear advantages in using ICT for personalization, and who have the institutional support to implement such tools, are more likely to be early adopters. Conversely, educators who lack resources or training may be hesitant to shift from traditional, one-size-fits-all teaching methods.

4.7 Influence of ICT Integration in Examinations on Academic Performance in Public Primary Schools

The fourth objective of this study examined the impact of ICT integration in examinations on academic performance in public primary schools. This analysis focused on three indicators: digital testing platform implementation, performance data analysis from digital assessments, and the frequency of tech-based formative assessments.

4.7.1 Digital Testing Platform Implementation

This section examines the influence of digital testing platform on academic performance in public primary schools. The results are as depicted in Figure 4.10.

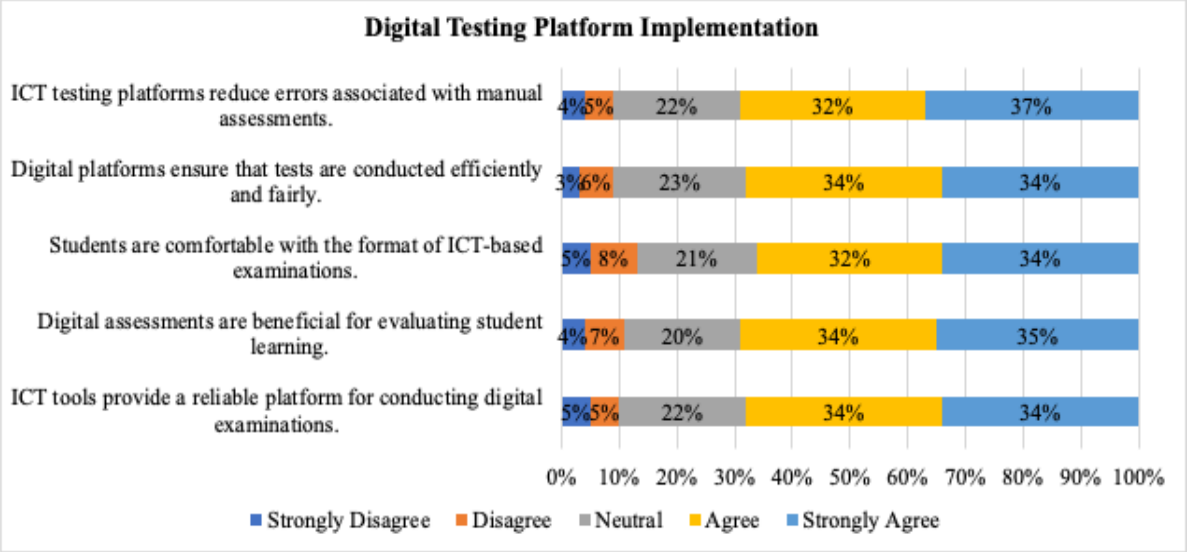

Figure 4. 10: Digital Testing Platform Implementation

A total of 68% of respondents (34% strongly agree, 34% agree) affirmed that ICT tools provide a reliable platform for conducting digital examinations. These platforms are credited with streamlining assessment administration through features such as automated grading, secure log-ins, and standardized test formats. Such features help reduce logistical errors, enhance consistency in evaluation, and minimize examiner bias. However, 22% of respondents remained neutral, which may suggest that some schools lack sufficient exposure to these technologies or have not yet integrated them into their regular assessment routines. These findings are consistent with Ochieng and Mwenda (2023), who observed that digital testing improved assessment efficiency and academic accountability in Kenyan classrooms.

In support of this, 69% of respondents (35% strongly agree, 34% agree) indicated that digital assessments are beneficial for evaluating student learning. ICT-based assessments facilitate a broader evaluation of learner competencies by supporting multiple question types and offering immediate feedback. They are also capable of assessing higher-order thinking skills such as analysis and synthesis, going beyond traditional recall-based questions. Despite this, 20% of respondents remained neutral, possibly reflecting disparities in ICT literacy or limited training in designing effective digital evaluations. Kimani and Wanjiku (2022) noted that comprehensive digital assessments helped schools in Kisumu County to better monitor learning outcomes and tailor instruction to student needs.

Additionally, 66% of teachers (34% strongly agree, 32% agree) reported that students are comfortable with the format of ICT-based examinations. Familiarity with digital platforms likely enhances students' test-taking confidence and reduces exam anxiety, particularly when exposure is routine. However, 21% of respondents were neutral and 13% disagreed, indicating that for some learners, particularly in underserved areas, limited access to computers or inadequate digital skills may hinder comfort and performance. Mutua and Njoroge (2020) emphasized that sustained exposure and training are necessary to build student confidence and proficiency in navigating digital assessments.

Digital testing platforms were also praised for promoting fairness and efficiency, with 68% of respondents (34% strongly agree, 34% agree) agreeing that ICT ensures objective and streamlined test administration. Automated scoring eliminates potential biases associated with manual grading, while randomized question orders help preserve exam integrity. However, 23% of respondents remained neutral, possibly due to concerns regarding technical reliability

or inconsistencies in access to necessary equipment across schools. Otieno and Muthoni (2023) similarly found that although digital testing improved assessment standardization, the need for robust infrastructure and contingency planning remained critical.

Lastly, 69% of teachers (37% strongly agree, 32% agree) agreed that digital platforms reduce errors commonly associated with manual assessments. Automation reduces instances of arithmetic miscalculation, missing entries, and subjective grading, thus fostering greater trust in assessment outcomes. Nevertheless, 22% of respondents were neutral, likely reflecting infrastructural limitations or intermittent technical issues that hinder full implementation in some schools. Tesha and Ngowi (2020) also reported that digital assessments enhanced accuracy and reduced administrative burdens in Tanzanian schools, where structured implementation frameworks were in place.

These findings resonate with the Diffusion of Innovation Theory, which explains that the adoption of digital testing platforms is influenced by perceived advantages such as enhanced efficiency, fairness, and reliability. Teachers who observe these benefits are more likely to integrate such innovations into their assessment practices. The gradual increase in student and teacher comfort with digital assessments further demonstrates how innovation spreads within educational settings, driven by observable, measurable improvements in teaching and learning processes.

4.7.2 Performance Data Analysis from Digital Assessments

This section explores the extent to which teachers use ICT tools to conduct tech-based formative assessments and their impact on student performance, as illustrated in Figure 4.11.

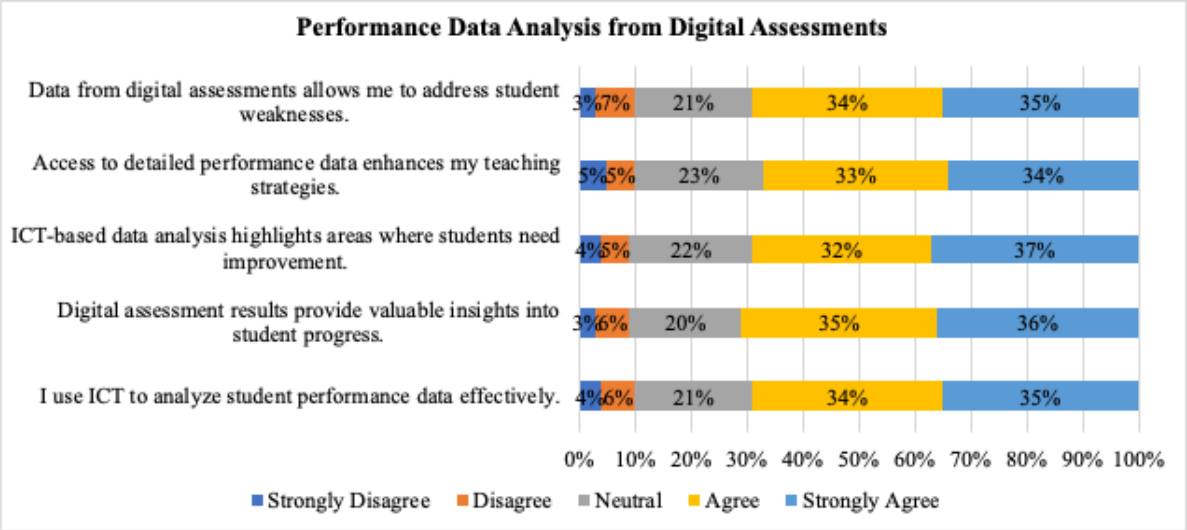

Figure 4. 11: Performance Data Analysis from Digital Assessments

A combined 69% of respondents (35% strongly agree, 34% agree) indicated that ICT tools enable them to analyse student performance effectively. These findings suggest that digital assessment platforms are increasingly valued for their capacity to generate timely and actionable performance metrics. Such analytics enable teachers to identify patterns across student cohorts, track learning progress over time, and detect areas requiring pedagogical intervention. However, 21% of respondents remained neutral and 10% disagreed or strongly disagreed, indicating that not all educators are equipped or confident in using these digital tools for data analysis. These gaps may stem from limited exposure to advanced data features or insufficient training in digital assessment literacy. Mutua and Njoroge (2020) similarly observed that effective use of assessment analytics was contingent on teachers' digital skills and access to user-friendly reporting platforms.

Further emphasizing the instructional value of ICT-based analytics, 71% of respondents (36% strongly agree, 35% agree) affirmed that digital assessment results offer valuable insights into student progress. These results help educators to identify learning gaps, monitor conceptual

mastery, and evaluate teaching effectiveness. ICT platforms often provide disaggregated data, allowing teachers to tailor interventions to individuals or groups based on specific performance trends. However, the 20% neutral responses suggest that some teachers may not be interpreting these insights with full confidence or regularity. Challenges such as inadequate ICT integration into lesson planning and time constraints could be contributing factors. Mwangi and Odhiambo (2021) found that teachers who consistently incorporated assessment data into their instructional decisions recorded up to a 25% improvement in student outcomes, highlighting the need for a strong feedback loop between assessment and instruction.

Moreover, 69% of respondents (37% strongly agree, 32% agree) agreed that ICT-based assessments highlight specific areas where students need improvement. Diagnostic features embedded in digital platforms allow teachers to pinpoint weaknesses in content mastery, track performance by topic or skill, and adjust instructional approaches accordingly. This supports evidence-based intervention and fosters targeted remediation. However, 22% of respondents were neutral and 9% disagreed, possibly due to unfamiliarity with data interpretation tools or limited platform functionality in some schools. García and Sánchez (2021) found that in Spanish primary schools, where diagnostic analytics were used to guide remedial teaching, there was a notable reduction in achievement gaps across diverse student populations.

Access to detailed performance data was acknowledged by 67% of respondents (34% strongly agree, 33% agree) as enhancing their teaching strategies. Such access allows educators to shift from intuition-based instruction to data-driven practices, aligning content delivery with learner needs and progression. Teachers can identify which lessons require reinforcement, which students need additional support, and which pedagogical approaches yield the best outcomes. Nevertheless, 23% of respondents were neutral, suggesting that not all teachers are

actively translating data into instructional change. This could reflect a lack of structured support in integrating data insights into daily teaching practice. Tesha and Ngowi (2020) found that teachers in Tanzanian schools who received ongoing professional development in data use were more likely to adapt their instructional methods and improve student performance.

Finally, 69% of teachers (35% strongly agree, 34% agree) stated that digital assessment data enabled them to address students' academic weaknesses effectively. This confirms the perceived usefulness of performance analytics in informing responsive teaching and personalized support. Teachers who access regular, reliable data can intervene early and prevent minor misunderstandings from escalating into persistent knowledge gaps. However, 21% of teachers responded neutrally and 10% disagreed, indicating that not all educators have embedded data-informed teaching into their routine practice. Ochieng and Mwenda (2023) reported that in schools where performance data was used systematically, teachers were better positioned to improve classroom learning outcomes through customized interventions.

These findings are strongly supported by the Constructivist Learning Theory, which emphasizes the need to adapt instruction to learners' evolving needs through continuous feedback and assessment. ICT-based analytics enable teachers to create dynamic, learner-centred environments that respond to individual progress and challenges, thereby enhancing conceptual understanding and mastery. Furthermore, the Diffusion of Innovation Theory explains the adoption of digital performance analytics as a response to their demonstrable advantages. Teachers who perceive ICT data tools as useful, accessible, and compatible with their teaching objectives are more likely to adopt them. Conversely, resistance may arise when teachers are not adequately supported through training or institutional structures.

4.7.3 Frequency of Tech-Based Formative Assessments

This section evaluates the extent to which teachers use ICT tools to analyze performance data from digital assessments and how these insights are applied to improve academic performance, as illustrated in Figure 4.12.

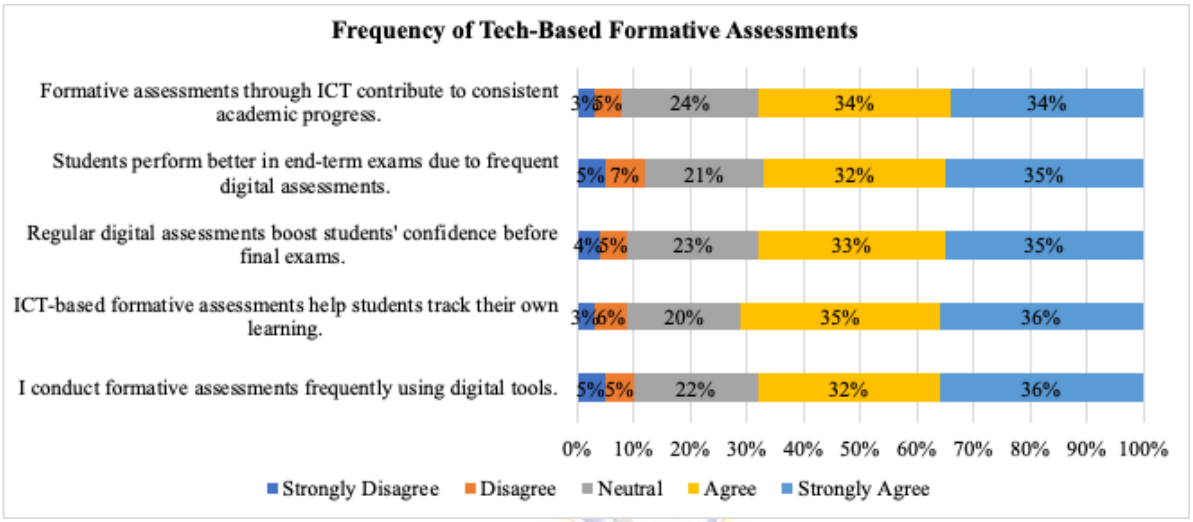

Figure 4. 12: Frequency of Tech-Based Formative Assessments

A total of 68% of respondents (36% strongly agree, 32% agree) reported that they regularly conduct formative assessments using digital platforms. This level of agreement reflects the growing integration of ICT into routine teaching practices, enabling teachers to evaluate student progress continuously. Through features such as quizzes, polls, and real-time feedback, formative assessments foster active participation and provide opportunities for learners to improve before summative evaluations. However, 22% of respondents were neutral, and 10% disagreed, suggesting disparities in access to resources or varying degrees of teacher proficiency in using digital tools. Mutua and Njoroge (2020) observed that schools equipped with reliable ICT infrastructure and teacher support systems were more likely to conduct regular formative assessments, which contributed to measurable improvements in academic performance.

Closely aligned with these findings, 71% of respondents (36% strongly agree, 35% agree) indicated that ICT-based formative assessments help students track their own learning progress. This suggests that digital assessments are not only teacher-led tools but also serve as mechanisms for student empowerment and self-regulation. When learners receive immediate feedback, they can identify areas of strength and weakness, monitor improvement over time, and engage in self-directed study. However, 20% of respondents were neutral, indicating that not all students may be fully prepared to engage with digital feedback autonomously. This could reflect gaps in digital literacy or the absence of a learning culture that values formative reflection. Kimani and Wanjiku (2022) emphasized that when teachers guide students on how to interpret and act upon assessment feedback, the result is greater academic accountability and sustained motivation.

Additionally, 68% of respondents (35% strongly agree, 33% agree) agreed that regular digital assessments boost students' confidence before final exams. These assessments mimic the structure and conditions of formal evaluations, enabling students to familiarize themselves with exam formats and question types. This exposure reduces anxiety and enhances exam preparedness, especially in core subjects such as mathematics and science. Nevertheless, 23% of respondents expressed neutrality, and 9% disagreed, indicating that in some contexts, digital assessments are underutilized or may not fully reflect the content and rigour of national examinations. Tesha and Ngowi (2020) reported that in Tanzanian schools where mock digital assessments were aligned with curriculum standards, students demonstrated improved performance and greater self-assurance during final exams.

Furthermore, 67% of teachers (35% strongly agree, 32% agree) affirmed that regular use of formative assessments contributes to improved end-term performance. By identifying and addressing learning gaps early, these assessments promote retention, reinforce classroom learning, and ensure that students are better prepared for high-stakes tests. However, 21% of respondents remained neutral and 12% disagreed, highlighting that consistent use of formative assessments is not universal. Constraints such as limited access to digital devices, lack of time, or absence of institutional policies supporting continuous assessment may hinder full implementation. Mwangi and Odhiambo (2021) found that in schools where formative assessments were embedded into weekly instructional routines, students recorded higher mean scores across subjects due to ongoing engagement and feedback.

Finally, 68% of respondents (34% agree, 34% strongly agree) reported that ICT-enabled formative assessments contribute to consistent academic progress throughout the term. This finding reinforces the role of continuous assessment in guiding learning and instruction. Digital tools allow teachers to track individual performance trends, adjust lesson content accordingly, and intervene promptly where necessary. Yet, 24% of teachers remained neutral and 8% disagreed, implying that some schools may face implementation challenges, such as unreliable internet connectivity or lack of clear policy directives on formative assessment frequency. García and Sánchez (2021) observed that in Spanish schools using integrated digital platforms, regular formative assessment improved student consistency in both participation and performance.

These findings are well supported by the Constructivist Learning Theory, which emphasizes the centrality of feedback, reflection, and active participation in knowledge construction.

Formative assessments facilitated through ICT promote these principles by encouraging students to engage continuously with content, reflect on their performance, and take corrective actions. In parallel, the Diffusion of Innovation Theory offers a framework for understanding the adoption of tech-based formative assessments. Teachers who perceive clear benefits in student progress, engagement, and ease of implementation are more likely to incorporate these tools into their regular teaching practices. However, adoption is often mediated by factors such as institutional support, teacher training, and perceived compatibility with existing workflows.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The chapters present summary, conclusions and the recommendations of the study guided by the objectives of the study:

5.2 Summary of the Findings

5.2.1 Influence of ICT Integration in Lesson Preparation on Academic Performance in Public Primary Schools

The study revealed that ICT integration significantly enhances lesson preparation, with 68% of respondents affirming that access to digital tools improves lesson quality and comprehensiveness. A further 70% agreed that ICT-based structured lesson plans enhance organization and interactivity, creating engaging and effective lessons. Multimedia resources were noted by 68% of respondents to improve student understanding of complex topics, emphasizing their role in enriching lesson delivery. However, challenges such as limited access to ICT tools and training were evident, as highlighted by 22% of neutral responses. These findings underscore the critical role of ICT in fostering student-centered and efficient lesson preparation practices.

5.2.2 Influence of ICT Integration in Classroom Teaching on Academic Performance in Public Primary Schools.

ICT integration in classroom teaching was found to significantly boost student engagement and participation. A total of 70% of respondents confirmed frequent use of interactive technology, which was credited with improving students' focus and participation during lessons. Additionally, 68% of teachers reported adapting lessons in real-time using ICT

feedback, enabling dynamic and responsive teaching strategies. Furthermore, 69% of respondents acknowledged the utility of ICT in tracking student participation, facilitating personalized interventions and better classroom management. Nonetheless, disparities in ICT access and teacher training limited the consistent implementation of these practices, as indicated by neutral responses from 22% of participants.

5.2.3 Influence of ICT Integration in Revisions and Private Studies on Academic Performance in Public Primary Schools

The findings highlighted the transformative role of ICT in supporting revisions and private studies. Access to online study resources was reported by 68% of respondents to enhance students' understanding of challenging subjects and foster independent learning. ICT-based practice tests and quizzes were noted by 70% of teachers to aid in exam preparation and performance by providing immediate feedback and opportunities for self-assessment. Additionally, 67% of respondents acknowledged that personalized learning plans facilitated by ICT address individual student needs effectively. However, neutral responses from 22–24% of respondents indicate gaps in digital literacy and infrastructure that could hinder optimal utilization of these tools.

5.2.4 Influence of ICT Integration in Examinations on Academic Performance in Public Primary Schools

ICT integration in examinations was found to improve efficiency, accuracy, and reliability. A total of 68% of respondents agreed that digital testing platforms enhance objectivity and reduce errors in grading. Similarly, 69% of teachers noted that ICT-based performance data analysis provided actionable insights, enabling targeted interventions and improved teaching strategies. Furthermore, frequent tech-based formative assessments were reported by 68% of

respondents to enhance students' confidence and readiness for summative exams. Despite these benefits, 21–23% of neutral responses reflected challenges such as inconsistent access to digital tools and insufficient teacher training, limiting widespread adoption in some contexts.

5.3 Conclusion

5.3.1 Influence of ICT Integration in Lesson Preparation on Academic Performance in Public Primary Schools

The integration of ICT in lesson preparation has significantly improved the quality, organisation, and interactivity of instructional planning. This study established that a majority of teachers rely on digital tools to source high-quality teaching materials, structure lesson content more effectively, and incorporate multimedia elements that cater to varied learning styles. Such practices were linked to improved lesson clarity and student engagement, thereby enhancing academic performance. However, gaps in ICT access and disparities in teacher proficiency remain key barriers, underscoring the need for capacity development and equitable infrastructure. These findings affirm that ICT, when effectively applied, plays a pivotal role in shaping student-centred, pedagogically sound lesson delivery.

5.3.2 Influence of ICT Integration in Classroom Teaching on Academic Performance in Public Primary Schools.

ICT integration within classroom teaching environments emerged as a critical enabler of learner engagement, participation, and instructional responsiveness. Teachers who adopted interactive technologies were better able to sustain students' attention, tailor lesson delivery in real time, and monitor engagement through digital tracking tools. These approaches translated into enhanced comprehension and inclusion. Nonetheless, inequities in ICT

deployment, as well as inconsistencies in teacher readiness, were observed to limit widespread impact. These results confirm that while ICT has transformative potential, its benefits are maximised when embedded within a supportive ecosystem that includes adequate resources and trained educators.

5.3.3 Influence of ICT Integration in Revisions and Private Studies on Academic Performance in Public Primary Schools

This study found that ICT significantly empowers students in their revision and private study practices, contributing to deeper learning and academic self-efficacy. Access to online resources, personalized learning platforms, and digital practice tools enabled learners to revisit complex concepts, self-assess, and engage in continuous preparation. Importantly, students benefitted from ICT-supported autonomy, which nurtured their confidence and readiness for examinations. Despite these gains, some learners faced obstacles due to limited ICT access, digital literacy gaps, and variable teacher support. The findings demonstrate that ICT is an essential instrument for fostering academic resilience and independent learning, particularly when aligned with student-specific needs.

5.3.4 Influence of ICT Integration in Examinations on Academic Performance in Public Primary Schools

The integration of ICT in examination practices was found to enhance assessment reliability, efficiency, and feedback mechanisms. Digital testing platforms minimised manual errors and facilitated equitable assessment through standardised administration. Teachers used data from digital assessments to identify learning gaps and inform instructional adjustments, thereby fostering responsive teaching. Formative assessments conducted via ICT helped sustain student motivation and academic progress. However, disparities in the implementation of

digital assessments across schools highlighted the importance of equitable ICT distribution and specialised training. The findings confirm that ICT enhances both the quality of assessments and the instructional value of performance data.

5.4 Recommendations

5.4.1 Influence of ICT Integration in Lesson Preparation on Academic Performance in Public Primary Schools

To fully leverage ICT in lesson preparation, the Ministry of Education, in collaboration with county governments and teacher training institutions, should prioritise sustained professional development programs. These should focus on equipping teachers with digital competencies for sourcing credible content, creating interactive lesson plans, and incorporating multimedia effectively. School administrators should ensure that all teaching staff have access to digital infrastructure, including computers, tablets, and stable internet connections. Education stakeholders should establish online repositories with curriculum-aligned, open-access teaching resources to support equitable content access. Peer learning communities, where teachers exchange ICT best practices and digital lesson design strategies, should also be institutionalised to foster collaborative innovation.

5.4.2 Influence of ICT Integration in Classroom Teaching on Academic Performance in Public Primary Schools.

School leaders should prioritise the procurement and maintenance of interactive classroom technologies such as smartboards, digital projectors, and learner devices. These investments must be accompanied by regular, context-specific training on how to use ICT to support differentiated instruction, real-time adaptation, and classroom management. Teachers should

be encouraged and supported to track student engagement through digital tools and to use feedback data to inform classroom interventions. Government bodies should work with ICT service providers to improve rural school connectivity and hardware access. Furthermore, policy frameworks should mandate ICT integration in daily teaching routines, with accompanying monitoring and support systems to ensure sustained implementation.

5.4.3 Influence of ICT Integration in Revisions and Private Studies on Academic Performance in Public Primary Schools

To strengthen ICT use in student revision and private study, schools should establish well-equipped digital study centres accessible beyond classroom hours. These centres should offer curated digital content, interactive quizzes, and multimedia learning aids aligned with the curriculum. School administrators and teachers should guide students on how to integrate ICT into their study routines, including the use of personalised learning platforms that adapt to learner needs. Policymakers and development partners should fund programs that build students' digital literacy and provide subsidised internet access for home-based learning. Partnerships with content providers can support the creation of localised, affordable revision materials, especially for marginalised communities.

5.4.4 Influence of ICT Integration in Examinations on Academic Performance in Public Primary Schools

To enhance the integration of ICT in assessments, the Kenya National Examinations Council (KNEC) and other regulatory bodies should pilot digital testing frameworks in public primary schools, particularly targeting counties with established ICT infrastructure. These pilot programs should include capacity building for teachers on administering and analysing digital

tests, with a focus on data interpretation for targeted instruction. Schools should be supported to acquire secure digital platforms capable of managing formative and summative assessments. Educational policymakers should also develop assessment policies that incorporate digital testing, including standards for data security, validity, and feedback delivery. Evaluation tools should be responsive to learner diversity and include formative feedback features that promote growth-oriented learning.

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APPENDICES.

APPENDIX I: Questionnaire

INFLUENCE OF INFORMATION AND COMMUNICATION TECHNOLOGY INTEGRATION ON LEARNERS' ACADEMIC PERFORMANCE IN PUBLIC PRIMARY SCHOOLS IN KYUSO SUB-COUNTY, KENYA."

The purpose of the questionnaire is to collect data that will assist in achieving the objectives of this study. I kindly request you to participate in this study by responding to the questions as clearly and honestly as possible. Your participation will be highly appreciated. All information you provide will be treated with utmost confidentiality and will be used solely for academic purposes.
The questionnaire is set up in sections. Please answer all questions in all the sections by ticking inside the box [√] the most appropriate answer or writing in the space provided where applicable.

PART I: DEMOGRAPHICS OF THE RESPONDENT

1. **Gender**

   Female [ ] Male [ ]

2. **What is your age bracket?**

   Below 20 [ ] 20 - 30 [ ] 30 - 40 [ ] 40 - 50 [ ] Above 50 [ ]

3. **What is your highest level of education?**

   Primary [ ] Secondary [ ] Diploma [ ] Undergraduate [ ] Postgraduate [ ]

4. **How long have you worked as a teacher?**

   Less than 1year [ ] 1- 5 years [ ] 6-10 years [ ] More than 10 years [ ]

PART A: INFLUENCE OF ICT INTEGRATION IN LESSON PREPARATION ON ACADEMIC PERFORMANCE

A. **Digital tools for sourcing lesson content:**

1. I frequently use digital tools to gather content for lesson preparation. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]
2. Digital resources provide high-quality materials for lesson content in my subject area.
   [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]
3. Using digital tools has made my lesson preparation more efficient. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]
4. I feel confident in sourcing reliable information through digital platforms for lessons.
   [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]
5. Access to digital tools enhances my ability to prepare comprehensive lesson content.
   [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]

B. **ICT-based structured lesson plans:**

1. Digital tools enable me to structure lesson plans effectively. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]
2. My lesson plans are more organized when I incorporate digital resources. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]
3. ICT allows me to create interactive lesson plans that improve student engagement. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]
4. Structured lesson plans created using ICT contribute to better academic outcomes. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]
5. I find digital tools essential for preparing well-organized lesson plans. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]

C. **Multimedia resources in lesson materials:**

1. Multimedia resources improve student understanding of lesson content. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]

2. I regularly incorporate multimedia resources into my lesson materials. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]
3. ICT tools make it easier to include images, videos, and simulations in lessons. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]
4. Multimedia elements enhance student engagement and interest in lessons. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]
5. The use of multimedia resources improves student comprehension of complex topics.
   [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]

PART B: INFLUENCE OF ICT INTEGRATION IN CLASSROOM TEACHING ON ACADEMIC PERFORMANCE

A. **Frequency of interactive technology use:**
   1. I regularly use interactive technology in the classroom. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]
   2. Students are more engaged when I use interactive technology during lessons. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]
   3. Interactive technology improves students' focus on lesson content. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]
   4. The use of technology has increased my confidence in delivering lessons. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]
   5. ICT tools are essential for maintaining student engagement in the classroom. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]

B. **Real-time digital lesson adaptation:**
   1. I can adjust lesson content in real-time using digital tools based on student responses.
      [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]
   2. Digital tools allow me to customize lessons for different learning needs. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]
   3. I frequently adapt my lesson plans during teaching based on ICT feedback. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]

4. Real-time ICT feedback helps me address student misunderstandings immediately.
   [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]
5. The ability to modify lessons on the spot enhances teaching effectiveness. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]

C. **ICT for tracking student participation:**

1. Digital tools help me track student participation throughout the lesson. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]
2. I use ICT to monitor student engagement levels in real-time. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]
3. Tracking participation with ICT allows me to identify students who need extra help.
   [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]
4. ICT-based tracking systems provide insights into individual student progress. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]
5. Using digital tools to track participation has improved overall class engagement. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]

PART C: INFLUENCE OF ICT INTEGRATION IN REVISIONS AND PRIVATE STUDIES ON ACADEMIC PERFORMANCE

A. **Access to online study resources:**

1. Students have access to diverse online resources for study and revision. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]
2. ICT tools make it easier for students to find relevant study materials. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]
3. Online resources improve students' understanding of challenging subjects. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]
4. I encourage students to use online resources for independent learning. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]
5. Students frequently use online resources to supplement classroom learning. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]

B. **ICT use for practice tests and quizzes:**

1. ICT provides an effective platform for administering practice tests. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]
2. Digital quizzes help students assess their understanding independently. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]
3. Students find ICT-based practice tests helpful for exam preparation. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]
4. The use of online quizzes has improved students' test performance. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]
5. ICT-based assessments encourage students to review lesson material. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]

C. **ICT for personalized learning plans:**

1. ICT allows me to create tailored learning plans for students. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]
2. Personalized learning through ICT meets individual student needs effectively. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]
3. Digital tools help students follow learning plans suited to their abilities. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]
4. ICT enables me to monitor progress on students' personalized study plans. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]
5. Personalized learning with ICT has positively impacted students' academic growth.
   [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]

PART D: INFLUENCE OF ICT INTEGRATION IN EXAMINATIONS ON ACADEMIC PERFORMANCE

A. **Digital testing platform implementation:**

1. ICT tools provide a reliable platform for conducting digital examinations. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]
2. Digital assessments are beneficial for evaluating student learning. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]

3. Students are comfortable with the format of ICT-based examinations. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]
4. Digital platforms ensure that tests are conducted efficiently and fairly. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]
5. ICT testing platforms reduce errors associated with manual assessments. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]

B. **Performance data analysis from digital assessments:**

1. I use ICT to analyze student performance data effectively. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]
2. Digital assessment results provide valuable insights into student progress. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]
3. ICT-based data analysis highlights areas where students need improvement. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]
4. Access to detailed performance data enhances my teaching strategies. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]
5. Data from digital assessments allows me to address student weaknesses. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]

C. **Frequency of tech-based formative assessments:**

1. I conduct formative assessments frequently using digital tools. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]
2. ICT-based formative assessments help students track their own learning. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]
3. Regular digital assessments boost students' confidence before final exams. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]
4. Students perform better in end-term exams due to frequent digital assessments. [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]
5. Formative assessments through ICT contribute to consistent academic progress.
   [Strongly Disagree] [Disagree] [Neutral] [Agree] [Strongly Agree]

APPENDIX II: Interview Guide

1. How has the use of digital tools influenced your approach to lesson preparation and content development?
2. What challenges do you face in incorporating multimedia resources (such as videos, images, etc.) into your lesson plans, and how do you overcome these challenges?
3. In what ways do you think ICT integration in lesson preparation impacts student understanding and engagement?
4. How does the use of interactive technology in the classroom affect student engagement and participation during lessons?
5. Can you describe a situation where you adapted your lesson in real-time using ICT based on student needs or responses? How effective was this approach?
6. What tools or methods do you use to track and monitor student participation through ICT, and what impact does this have on your teaching?
7. How do you support students in accessing online resources for revision and independent study, and what effect do these resources have on their learning?
8. How do ICT-based practice tests and quizzes contribute to student preparation and performance in exams?
9. In what ways do you personalize learning plans for students using ICT, and how effective do you find this approach in addressing individual learning needs?
10. How has the implementation of digital testing platforms affected the examination process in terms of fairness, efficiency, and accuracy?
11. What role does ICT-based performance data analysis play in helping you identify areas where students need improvement?
12. How frequently do you use formative assessments through digital tools, and how do you perceive their impact on student confidence and academic progress?

APPENDIX III: Ethical Clearance

Mount Kenya University

REF: **MKU/ISERC/4616** Date: 08 January 2025
TO: **FLORENCE KATUMBU MUSILI**
REG: **MED/2021/77047**

Dear Sir/Madam,

RE: INFLUENCE OF INFORMATION AND COMMMUNICATION TECHNOLOGY INTEGRATION ON LEARNERS' ACADEMIC PERFORMANCE IN PUBLIC PRIMARY SCHOOLS IN KYUSO SUB-COUNTY, KITUI COUNTY KENYA

This is to inform you that **Mount Kenya University** has reviewed and approved your above research proposal. Your application approval number is **3338.** The approval period is **08/01/2025 - 07/01/2026.**

This approval is subject to compliance with the following requirements:

i. Only approved documents including informed consents, study instruments, MTA will be used
ii. All changes including amendments, deviations and violations are submitted for review and approval by **Mount Kenya University**
iii. Death and life-threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to **Mount Kenya University** within 72 hours of notification
iv. Any changes, anticipated or otherwise that may increase the risks or affect the safety or welfare of study participants and others or affect the integrity of the research must be reported to **Mount Kenya University** within 72 hours
v. Clearance for export of biological specimens must be obtained from relevant institutions
vi. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal
vii. Submission of an executive summary report within 90 days upon completion of the study to **Mount Kenya University**

Prior to commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology and Innovation (NACOSTI) https://research-portal.nacosti.go.ke and also obtain other clearances needed.

MOUNT KENYA UNIVERSITY
ETHICS REVIEW COMMITTEE
P. O. Box 342 - 01000,
THIKA

Yours sincerely,

Dr. Alfred Owino, PhD
Chairman, Mount Kenya University ISERC

Main Campus, General Kago Road, P.O. Box 342-01000 Thika.
Tel: +254 20 287 8000, Cell: +254 709 153 000
Email: info@mku.ac.ke, Web: www.mku.ac.ke
Chartered and ISO 9001 : 2015 Certified

APPENDIX IV: Introduction letter

Mount Kenya University

DIRECTORATE OF GRADUATE STUDIES

MED/2021/77047

9th January, 2025

National Commission for Science Technology & Innovation (NACOSTI)
Off Waiyaki, Upper Kabete
P.O Box 30623- 00100
NAIROBI, KENYA

Dear Sir/Madam,

RE: FLORENCE KATUMBU MUSILI- REGISTRATION NO. MED/2021/77047

The purpose of this letter is to introduce the above named student who is pursuing **Master of Education** in the **Department of Educational Management and Curriculum Studies** in the **School of Education.**

The title of the research is **"Influence of Information and Communication Technology Integration on Learners' Academic Performance in Public Primary Schools in Kyuso Sub-County, Kitui County, Kenya."** It has been cleared by the University's Ethics Review Committee (Certificate attached) and now has to proceed to the field to collect data between **January, 2025 and March, 2025.**

Any assistance accorded to the student will be highly appreciated.

Thank you.

Mount Kenya University P.O. Box 342-01000, THIKA Office of the Director, Graduate Studies

Dr. Samuel M. Karanja, Ph.D
Director, Graduate Studies
Enc.

Main Campus, General Kago Road, P.O. Box 342-01000 Thika.

APPENDIX V: Research Permit

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **748457**

Date of Issue: **29/January/2025**

RESEARCH LICENSE

This is to Certify that Ms.. Florence Katumbu Musili of Mount Kenya University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Kitui on the topic: INFLUENCE OF INFORMATION AND COMMMUNICATION TECHNOLOGY INTEGRATION ON LEARNERS' ACADEMIC PERFORMANCE IN PUBLIC PRIMARY SCHOOLS IN KYUSO SUB-COUNTY, KITUI COUNTY KENYA for the period ending : 29/January/2026.

License No: **NACOSTI/P/25/415544**

748457

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

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See overleaf for conditions

APPENDIX VI Research Authorization

THE COUNTY GOVERNMENT OF KITUI

Office of the County Secretary. Head of County Public Service and Secretary to Executive Committee

CGKTI/CS/ADM/54/VOL 1/205 12/06/2025

TO WHOM IT MAY CONCERN

RESEARCH AUTHORIZATION

The County Government of Kitui has authorized Florence Katumbu Musili of Mount Kenya University, holder of License No, NACOSTI/P/24/3534, to conduct research and collect data on topic:

"Influence of ICT Integration on Learner' Academic Performance in Public Primary Schools in Kyuso Sub-County, Kitui County"

for the period ending 30 th August 2025.

The research is for the award of a Master's Degree in Curriculum Studies at Mount Kenya University.

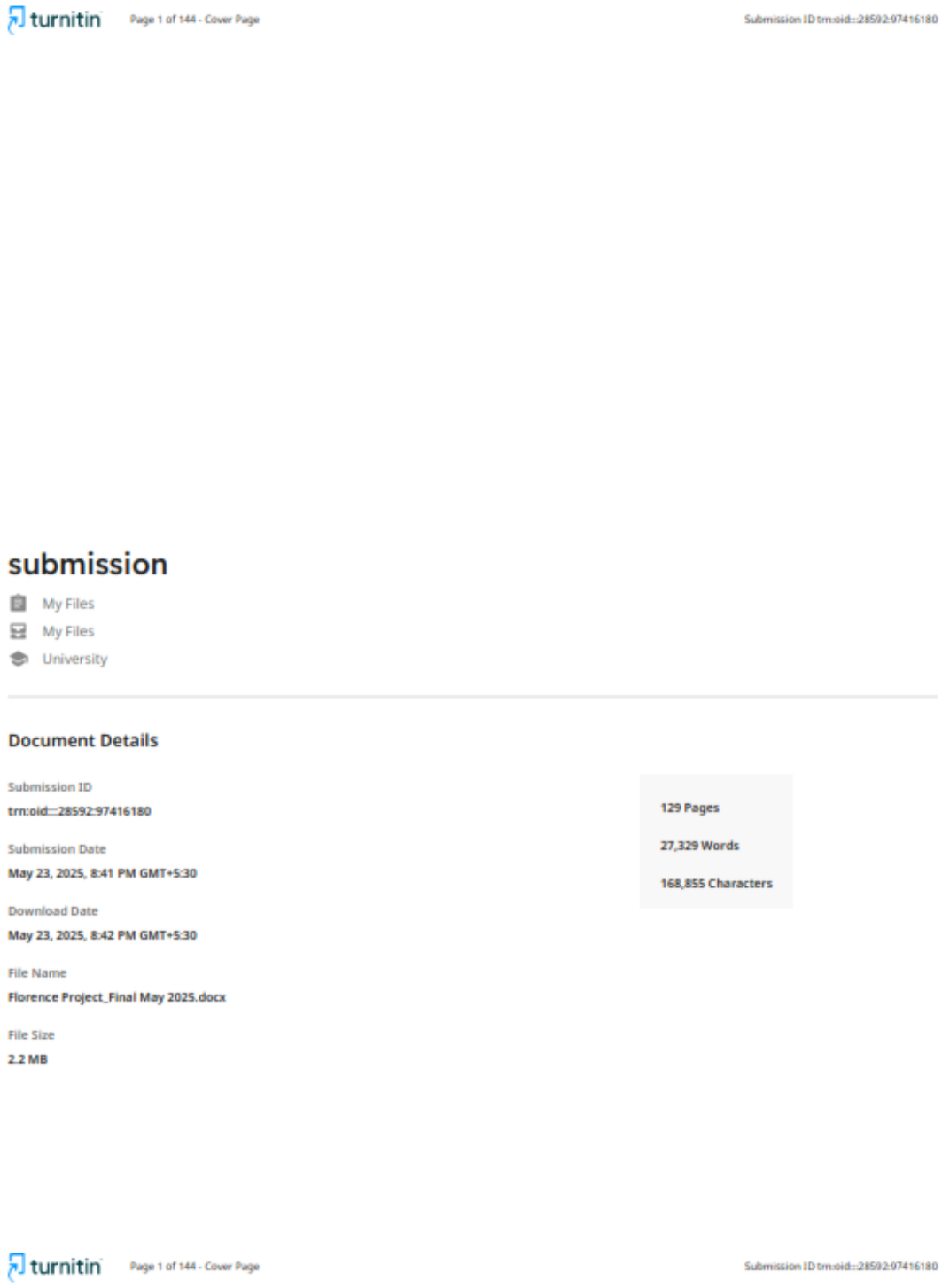
The researcher is required to comply with Section 53 of the Data Protection Act 2019 and the laws governing research activities.

COUNTY GOVERNMENT OF KITUI

PATRICK MUTUA

FOR: COUNTY SECRETARY

APPENDIX VII: Plagiarism Report



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APPENDIX VIII: Map of study area