

**INTEGRATION OF ICT IN THE TEACHING AND LEARNING PROCESS IN
THE COMPETENCE-BASED CURRICULUM FRAMEWORK IN RURAL
PUBLIC JUNIOR SECONDARY SCHOOLS, NYAMACHE
SUB-COUNTY, KISII, KENYA.**

BY

OBADIAH NYAKWARA ORANGI

**A THESIS SUBMITTED TO THE SCHOOL OF EDUCATION,
DEPARTMENT OF EDUCATIONAL MANAGEMENT AND POLICY
STUDIES IN PARTIAL FULFILMENT OF THE REQUIREMENTS
FOR THE AWARD OF A DEGREE OF MASTER OF
EDUCATION IN RESEARCH**

MOI UNIVERSITY

2025

DECLARATION

Declaration By the Candidate

This thesis is my original work and has not been presented for a degree at any other university. No part of this thesis may be reproduced without the prior written permission of the author and /or Moi University.



Signature: _____

Date: 12/07/2025

Obadiah Nyakwara Orangi

MSR/6504/24

Declaration By Supervisors

This thesis has been submitted for examination with our approval as university supervisors.



Signature: _____

Date: 12/08/2025

Prof. Ann Syomwene Kisilu

Department of Curriculum, Instruction, and Educational Media.

School of Education

Moi University



Signature: _____

Date: 12/08/2025

Dr. Emily Bomett

Department of Educational Management and Policy Studies.

School of Education

Moi Universi

DEDICATION

I dedicate this work to my loving wife, Loyce Obwoye, whose love, patience, moral support and understanding during my study period enabled me to complete this thesis.

To my sons, Rian and Reign, I pray that they will work hard and follow in my footsteps in the pursuit of knowledge to transform society and the generations that shall come after them. Lastly, my parents, Johnson Orangi and Askah Mokeira, and my brothers and sisters, for their unwavering support in my academic journey. God bless you all.

ACKNOWLEDGEMENT

I acknowledge God for his grace during the research. Equally, I sincerely thank my supervisors, Prof. Ann Kisilu and Dr. Emily Bomett, for their invaluable guidance and support in ensuring that my work met the standards set by Moi University. Specifically, I appreciate the Junior Secondary Schools teachers and the Heads of Institutions who participated in piloting and the data collection stages of this work. I also thank my friends and colleagues for their encouragement and support to ensure this research project is undertaken successfully.

ABSTRACT

Under Sustainable Development Goal 4, Kenya's Competence-Based Curriculum (CBC) was introduced to align education with the demands of the 21st century, including competencies in digital literacy. The curriculum reform emphasises ICT integration in teaching and learning by promoting digital tools, improving access to ICT resources, and enhancing digital competencies. Despite government efforts, rural Junior Secondary Schools still face challenges amid limited empirical research on the practical implementation of ICT in this setting. The purpose of this study was to examine the integration of ICT in the teaching and learning process within the Competency-Based Curriculum (CBC) framework in rural public Junior Secondary Schools in Nyamache Sub-County, Kisii, Kenya. The study pursued four objectives: to determine instructional methods employed by teachers in ICT integration; to examine gaps in teacher competencies for effective ICT use; to assess existing school infrastructure and resources; and to explore administrators' experiences with ICT integration. The Technological Pedagogical Content Knowledge (TPACK) framework guided the study, which adopted a mixed-methods approach within a pragmatic paradigm and explanatory sequential design. Nineteen public Junior Secondary Schools were sampled, involving 19 Heads of Institutions and 70 teachers. Heads of Institutions were purposively selected, while teachers were randomly sampled. Data was collected through structured questionnaires and semi-structured interviews, whereby Validity was ensured through content and construct validity. Quantitative data was analysed using descriptive statistics, and qualitative data was thematically analysed. Findings revealed that ICT-based instructional methods were minimally used ($M = 2.16$, $SD = 0.74$), with strategies like flipped classrooms (66%) and gamification (58%) rarely applied. Teachers expressed confidence in using ICT (73%), but actual use remained low (61%), reflecting a gap between perceived competence and practice ($M = 2.88$, $SD = 0.97$). Access to ICT resources was inadequate ($M = 2.02$, $SD = 0.68$), with 72% citing a lack of equipment and 81% poor connectivity. Qualitative data highlighted five themes: infrastructure challenges, teacher capacity gaps, integration in instruction and assessment, financial/policy constraints, and future priorities. Additionally, administrators reported challenges in resource allocation, policy implementation, and institutional support for digital learning. The study recommends capacity-building workshops, regular digital pedagogy training, improved ICT infrastructure, and increased funding. The Ministry of Education is to create structured digital platforms and support schools continuously. The study concludes that ICT integration in rural Junior Secondary Schools remains limited due to weak instructional practices, inadequate teacher skills, and poor infrastructure and connectivity.

TABLE OF CONTENTS

DECLARATION.....	ii
DEDICATION	iii
ACKNOWLEDGEMENT	iv
ABSTRACT.....	v
TABLE OF CONTENTS.....	vi
LIST OF TABLES	x
LIST OF FIGURES	xi
ABBREVIATIONS AND ACRONYMS	xii
CHAPTER ONE	1
INTRODUCTION TO THE STUDY	1
1.0 Introduction.....	1
1.1 Background to the study	1
1.2 Statement of the Problem.....	11
1.3 Purpose of the Study	13
1.4 Objectives of the Study	13
1.5 Research questions.....	13
1.6 Significance of the Study	14
1.7 Justification of the Study	14
1.8 Limitations of the Study	15
1.9 Assumptions of the Study	17
1.10 Scope of the Study	18
1.11 Theoretical framework.....	19
1.11.1 Technological Pedagogical Content Knowledge (TPACK) Theory.....	19
1.11.2 Technological Knowledge (TK).....	20
1.11.3 Pedagogical Knowledge (PK).....	20
1.11.4 Content Knowledge (CK)	20
1.11.5 Technological Pedagogical Knowledge (TPK).....	20
1.11.6 Technological Content Knowledge (TCK)	20
1.11.7 Pedagogical Content Knowledge (PCK).....	21
1.11.8 Technological Pedagogical Content Knowledge (TPACK)	21
1.12 Conceptual Framework.....	24
1.13 Operational Definition of Terms	25

CHAPTER TWO	28
LITERATURE REVIEW.....	28
2.0 Introduction	28
2.1 Concept of ICT in CBC Implementation	28
2.2 Instructional methods for ICT integration in the Competence-Based framework.	32
2.3 Professional Development Needs for Effective ICT Integration in the Competence-Based Curriculum (CBC).....	37
2.4 Assessment of existing School infrastructure in the CBC framework.....	45
2.5 Administrative Support Strategies for ICT Integration in Schools in the CBC Framework.....	48
2.6 Research gaps.....	50
2.7 Summary of the Literature Review	52
CHAPTER THREE	55
RESEARCH METHODOLOGY	55
3.0 Introduction.....	55
3.1 Research Design and Approach	55
3.2 Research Paradigm.....	55
3.3 Study Location	57
3.4 Target Population	58
3.5 Sampling Frame	59
3.5.1 Sampling procedure	60
3.6 Data Collection Methods	60
3.6.1 Structured Questionnaires.....	61
3.6.2 Semi-Structured Interview Schedules.....	61
3.7 Validity of the Research Instruments	62
3.8 Reliability of the Research Instruments	63
3.9 Administration of Instruments	64
3.10 Data Analysis Procedures	64
3.11 Ethical Issues in Research.....	65
CHAPTER FOUR.....	67
DATA PRESENTATION, ANALYSIS, INTERPRETATION, AND DISCUSSION	67
4.0 Introduction.....	67

4.1 Demographic information of participants	68
4.1.1 Response Rate.....	68
4.1.2 Demographic data from Junior Secondary Schools teachers.....	68
4.1.3 Demographic data from Junior Secondary Schools Heads of Institutions ..	72
4.2 Data Presentation and Analysis.....	74
4.3 Instructional Methods Employed by Teachers for ICT Integration	74
4.3.1 Blended Learning.....	75
4.3.2 Flipped Classroom	75
4.3.3 Gamification	76
4.3.4 Collaborative learning.....	76
4.3.5 Simulation-based learning	76
4.4 Gaps in Teacher Competency with ICT Integration	78
4.4.1 Confidence in ICT Integration	78
4.4.2 Frequency of ICT Use.....	79
4.4.3 Technical Skills.....	79
4.4.4 Pedagogical Knowledge.....	79
4.4.5 Designing Digital Content	79
4.4.6 Assessment Strategies	80
4.5 Assessment of Existing School Infrastructure and Resources for Effective ICT Integration in the CBC Framework	81
4.5.1 Adequacy of ICT resources.....	81
4.5.2 Tablet availability.....	82
4.5.3 Internet access.....	83
4.5.4 Availability of interactive whiteboards	83
4.6 Administrators' experiences in ICT integration into the teaching and learning process.	85
4.6.1 ICT Infrastructure and Resource Constraints	87
4.6.2 Teacher Competency and ICT Training.....	89
4.6.3 ICT Integration in Teaching and Assessment.....	90
4.6.4 Financial and Policy Constraints	92
4.6.5 Future Directions and Recommendations.....	93
4.7 Discussion of Key Findings	94
4.8 Summary of the Chapter	100

CHAPTER FIVE	102
SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS	102
5.1 Introduction.....	102
5.2 Summary of Findings.....	102
5.2.1 The Instructional Methods Employed by Teachers in ICT Integration.....	102
5.2.2 Teacher Professional Development Needs for Effective ICT Integration.	103
5.2.3 ICT Resource Availability in teaching and learning processes.....	104
5.2.4 Administrators' experiences with ICT integration in teaching and learning processes.....	105
5.3 Conclusion	106
5.4 Recommendations.....	108
5.5 Implications of the Study	109
5.6 Suggestions for Further Research	110
REFERENCES	111
APPENDICES	121
Appendix I: Letter of Introduction.....	121
Appendix II: Moi University Research Authorisation	123
Appendix III: Informed Consent.....	124
Appendix IV: Questionnaires for Grades 7, 8, & 9 Junior Secondary Schools Teachers	125
Appendix V: Interview Questions for Junior Secondary Schools Heads of Institutions.....	128
Appendix VI: NACOSTI Permit Research License	131
Appendix VII: Sub-County Director of Education Permit	132
Appendix VIII: Plagiarism Awareness certificate.....	133

LIST OF TABLES

Table 3.1 Sampling Frame	59
Table 4.1 Demographic profiles of Junior Secondary Schools teachers.....	69
Table 4.2 Instructional Methods for ICT Integration.....	75
Table 4.3 Teacher Competency Gaps.....	78
Table 4.4 Assessment of school infrastructure.....	81
Table 4.5 Themes and sub-themes	86

LIST OF FIGURES

Figure 1.1 Conceptual Framework	24
---------------------------------------	----

ABBREVIATIONS AND ACRONYMS

CBC	Competence-Based Curriculum
CBE	Competence-Based Education
ICT	Information Communication and Technology
J.S.S.	Junior Secondary Schools
KICD	Kenya Institute of Curriculum Development
KNUT	Kenya National Union of Teachers
MoE	Ministry of Education
NACOSTI	National Commission for Science, Technology and Innovation
PWPER	The Presidential Working Party on Education Reform
8.4.4	Eight years in primary school, four years in secondary school, and four years in college/university.
THE CBC (2.6.3.3)	Two years in pre-primary, six years in primary, three years in Junior Secondary Schools, and three years in senior school.

CHAPTER ONE

INTRODUCTION TO THE STUDY

1.0 Introduction

This chapter entails the following sections: The background to the study, statement of the problem, purpose of the study, objectives of the study, research questions, significance of the study, justification of the study, limitations of the study, assumptions of the study, scope of the study, theoretical framework, conceptual framework, definition of terms.

1.1 Background to the study

The Competency-Based Curriculum (CBC) in Kenya refers to a learner-centred educational framework introduced to replace the 8-4-4 system. Its main objective is to develop learners' competencies by focusing on the acquisition of knowledge, skills, values, and attitudes that are applicable in real-life situations. Unlike the traditional content-based approach, CBC emphasises what learners can do with the knowledge they acquire, fostering critical thinking, creativity, communication, and collaboration. The curriculum is structured under the 2-6-3-3-3 system and is designed to be inclusive, flexible, and responsive to the needs of the 21st-century learner. According to the Kenya Institute of Curriculum Development (2017), CBC aims to produce “engaged, empowered, and ethical citizens” by equipping learners with competencies that will enable them to thrive in a dynamic world (KICD,2017)

The Competence-Based Curriculum (CBC) in Kenya aims to develop practical skills, knowledge, attitudes, and values through experiential learning and critical thinking. It focuses on key competencies like communication and digital literacy, promoting learner-centred teaching and continuous assessment. The CBC has positively impacted student engagement and skill acquisition, though challenges like teacher preparedness

and resource availability remain (Ministry of Education, 2021; Jwan & Ong'ondo, 2021; KICD, 2022).

Information Communication Technology (ICT) integration in teaching refers to the seamless incorporation of information and communication technologies to support and enhance the attainment of curriculum objectives, foster appropriate competencies such as skills, knowledge, attitudes, and values, and manage education effectively and efficiently at all levels (Ministry of Education, 2021).

In the context of the Competency-Based Curriculum (CBC) in Kenya, key aspects of teaching include professional development, classroom implementation, adaptation to changes, addressing challenges, fostering student interaction, providing feedback, collaboration, support systems, and assessment practices. These factors are crucial for effective CBC implementation, requiring ongoing training and adaptation (Ministry of Education, 2017). Research highlights the importance of both support systems and professional development in facilitating successful curriculum transitions in Kenya and internationally (Owino, 2019; Darling-Hammond et al., 2017). Despite challenges such as resource limitations and large class sizes, Kenyan educators demonstrate resilience and innovation in fostering student-centred learning environments (Waweru & Kihara, 2020).

A few of the countries in the world have made great strides to implement ICT integration, although with unique levels of success. According to Nthiga & Wawira (2023), CBC came up first in the United States of America (USA) as a response to the Soviet Union's launch of its first satellite. Since then, the implementation has faced multiple challenges. The curriculum reforms in the USA began with teacher education as the U.S. Department of Education aligned the learning and training institutions with the CBC learning and teaching approaches (U.S.A Department of Education, 2018).

This has deliberately been implemented to position the system to embrace resilience and have learners that take up resilience without considering their studying environment and period (Sturgis,2018)

In 2009, Mexico transformed its education system from the old curriculum to CBC; this was a government directive in 1990 (Smith,1996) resulting from weaknesses that were observed in the level of skills of the workforce in Mexico due to economic changes and technological pace. This curriculum emphasized effectiveness, costs, efficiency, and educational outcomes (Stanley,1993). The inadequacy of skilled Labor gave birth to reforms in education. This is important to this research because it focuses on the realization of CBC objectives, which depends on the key implementors of this curriculum, the teachers. The next paragraph focuses on the United Kingdom.

In the United Kingdom, the competency-based curriculum has attained stability, emphasizing what can be done with what one knows. What is learned in school is supposed to be applied by the learner in their daily life in real situations. In the United Kingdom, school knowledge is only useful if it contributes to giving solutions to problems and needs of society. Consequently, this brings about positive change in the country's Gross Domestic Product. Resnik, (2009)

In Germany, the concept of Competency-Based Education was born in 1970 and is characterized by a high degree of abstract knowledge and skills. Twenty-six years later, the German education system embarked on an action competence approach. In this line of thought, competence was manifested as the capacity and readiness of an individual to thoughtfully act (Weigel et al., 2007). This competence was categorized as follows: personal competence, social competence, and subject competence.

Globally, learners are prepared for the economy in deep connection to the paradigm of education that is practical using a Competence-Based Curriculum (CBC). Countries such as the Netherlands, Finland, and Denmark, under the Organization for Economic Co-operation and Development (OECD), are already progressing very well with CBE (OECD, 2019). In this curriculum, learners were supposed to learn at their own pace since it is learner-centered and allows personalized learning approaches, (Munavu 2023, P.17). Akala, (2021) reported that the CBC was found to be a powerful avenue for learners' preparation in their readiness to succeed in the global economy.

South Africa was the first country in Africa to adopt the Competency-Based Curriculum (CBC), which traces its roots to debates on competency in Australia and New Zealand (Christie, 1995). The CBC aimed to address racial inequalities in education and respond to widespread unemployment by regulating the labour market and promoting the acquisition of skills (Nsengimana, 2020). This case is significant to the current research as it provides insights into real-life challenges that teachers and learners may encounter in acquiring the necessary skills for effective CBC implementation.

In 2013, Zambia revised its curriculum from a knowledge or content-based curriculum to a skills or competence-based curriculum. This adoption was done in response to the global call on Sustainable Development Goal number four and Vision 2030. Zambia had also set out national educational goals, and this curriculum was meant to meet them for lifelong and all-around learner development through individual self-reliance.

Tanzania developed and adopted CBC because of the problem that arose from the system of training, which affected the quality in the job market. The previous curriculum did not specify skills that students should attain as they completed their study courses should help students.

Rwanda transitioned to CBC in April 2015. The transition from a knowledge-based to a competence-based curriculum was driven by the primary goal of preparing school graduates to meet the requirements of the workforce and equipping them with problem-solving abilities (Nsengimana, 2020). This was done in efforts to attain transformation in education keeping constant aspects of learning being enjoyable, habit formation, profound, and obtaining high standards and achievements. This system has been lauded for being less academic and focusing on practical aspects (Cheptoo, 2019). However, implementation challenges came into play in Rwanda in terms of inadequate learning resources, large classes, lack of support from parents, inadequate, qualified teachers, and insufficient teaching resources.

Kenya's Vision 2030 aims to transition the country into an industrialised middle-income economy, leveraging ICT as a core driver for socio-economic transformation. The Ministry of Education (MoE) is committed to delivering high-quality education that prepares learners to excel in a technology-driven global economy. By integrating technology into teaching, learning, and management, educational institutions can support the development of 21st-century skills necessary for the Competency-Based Curriculum (CBC) and Competency-Based Education and Training (CBET). Critical to this integration are policies, professional development needs, digital content, and ICT infrastructure. Sustainable Development Goal (SDG) No. 9 further emphasises the role of ICT in developing knowledge societies and advocating for resilient infrastructure and innovation. Similarly, the World Summit on the Information Society (WSIS) 2014 highlights the necessity of ICT connectivity in schools to provide educational resources, enhance administrative processes, and support teacher training.

The implementation of the Competency-Based Curriculum (CBC) in Kenya marks a significant shift towards a learner-centred approach, emphasising the development of

practical skills for the 21st century. This study aims to examine the integration of ICT by Junior Secondary Schools teachers in Nyamache Sub-County, focusing on instructional methods, teacher competencies, and administrative support in the CBC framework. By analysing the strategies, practices, and perspectives of these educators, the research seeks to provide valuable insights into the effectiveness of CBC implementation and the factors that influence ICT integration, particularly in terms of teacher competencies.

UNESCO's Education Strategy 2014-2021 and the Africa Agenda 2063, alongside the Continental Education Strategy for Africa (CESA) 2016-2025, also prioritise the use of ICT to expand learning opportunities and improve education quality. These strategies aim to enhance access to ICT, particularly in developing countries, and integrate ICT into education systems to boost management, access, and quality. The National Education Sector Strategic Plan (NESSP) 2018-2022 strongly advocates for technology's role in building a modern and successful society, envisioning a robust ICT foundation within the curriculum at all levels. With the implementation of the Competency-Based Curriculum (CBC), the Kenyan government emphasises the development of digital literacy as a core competency, ensuring that education remains relevant and effective in a technology-oriented world.

Kenya's Digital Literacy Programme (DLP) was launched in 2013 as part of the government's initiative to integrate ICT into education. The program's vision is to enhance learning using digital technologies, aiming to equip students with 21st-century skills (Ministry of ICT, Innovation and Youth Affairs, 2020). It includes the distribution of tablets to primary school students, teacher training, and the development of digital content. As of now, the implementation has faced challenges such as delays in device distribution, inadequate infrastructure, and insufficient teacher training (Muindi, 2019).

However, progress has been made, with many schools having received devices, and ongoing efforts are being made to improve infrastructure and teacher readiness (Republic of Kenya, 2021).

The transition to a Competence-Based Curriculum (CBC) has posed significant challenges and opportunities for teachers. Research indicates that teachers have experienced both positive and negative impacts during this shift. On the positive side, teachers report an increase in student engagement and practical application of skills, as the CBC emphasises real-world competencies over rote memorisation (Karanja & Nyambura, 2020). However, many teachers also face difficulties, such as inadequate training and insufficient resources to implement the new curriculum (Oluoch, 2019). Additionally, there is a reported increase in workload as teachers must design and assess tasks that align with competence-based outcomes (Njogu, 2021). Overall, while the CBC offers potential for improved learning, it necessitates substantial support and professional development for teachers to navigate the associated challenges effectively.

The implementation of the Competence-Based Curriculum (CBC) in Teaching has ushered in a paradigm shift, focusing on developing practical skills over theoretical knowledge. This approach aims to enhance students' communication abilities, critical thinking, and creativity, aligning with global educational standards (Wachira, 2019). However, the integration of Information and Communication Technology (ICT) in this context presents unique challenges and opportunities. ICT tools can facilitate interactive and engaging learning experiences, providing access to diverse resources and fostering collaborative learning environments (Mwangi, 2020). Despite these advantages, several concerns persist. Many teachers lack adequate training and confidence in using ICT effectively, which can hinder the successful implementation of CBC (Omondi, 2021). Additionally, disparities in access to technology and reliable

internet connectivity exacerbate inequalities, particularly in under-resourced schools. Addressing these issues requires targeted professional development programs and investments in infrastructure to ensure all students benefit from the integration of ICT in teaching in the CBC framework.

The Competence-Based Curriculum was introduced in Kenya to foster critical thinking, creativity, and practical skills among students. The demands for the acquisition of 21st-century skills have grown in everyday life, not leaving behind the globalisation of the labour market, affecting learning and teaching processes. As a result, the need for the acquisition of competencies that are key competencies has grown. ICT is one of the most important components of the 21st-century era (Syomwene et al., 2023). The East African community established an agreement in 2013 that there was a need for a harmonised curriculum, referred to as Competence-Based Education (CBE), to align with global trends (Heto, P.P. K et al., 2020).

The introduction of the Competence-Based Curriculum in Kenya aimed to cultivate critical thinking, creativity, and practical skills among students. The Nyamache Sub-County provides a unique context for this research, enabling a thorough examination of the experiences of Junior Secondary Schools teachers within a specific geographic and educational setting. The demand for 21st-century skills has increased in everyday life, influenced by the globalisation of the labour market, impacting learning and teaching processes. Consequently, there is a growing need for the acquisition of key competencies. ICT stands out as a crucial component of the 21st-century era (Syomwene et al., 2023). In 2013, the East African Community established an agreement recognising the necessity for a harmonised curriculum, known as Competence-Based Education, to align with global trends.

In Kenya, there are several factors affecting the implementation of CBC. According to a report by the Kenya National Union of Teachers (KNUT) (2019), the factors include Inadequate learning resources, inadequately trained teachers, and ICT challenges in educational facilities. Since 2019, nothing much has been done regarding these concerns. According to the report presented to the Kenyan government president, 22.9% of the submissions showed huge congestion in classrooms. 23.2% of the submissions revealed inadequate ICT infrastructure for effective digital learning, (Munavu, 2023, P. 31). The same report postulated that the number of learning areas was high enough to be covered within the allocated time and available resources, and the public had not been sensitized more on what CBC entails, and this led to misleading information.

Teachers play a significant role in the implementation of the CBC and the transformation of learners. As a result, the quality of this curriculum relies heavily on the quality of the implementers and the teachers. Due to this, teachers need to be sufficiently trained in their teaching methods, assessment, and use of learning and teaching resources to be able to produce quality learners (Darling-Hammond, 2000). The quality of a teacher and their significance are not comparable to any variable. Other variables can be manipulated, and the curriculum objectives can be met. Teacher preparedness, training, and concerns must be strictly addressed to meet curriculum objectives (Reeves, 2004). On the same note, Jadama (2014) posits that how much an instructor knows and comprehends the subject at hand reflects how effectively and well they can teach the curriculum to learners.

According to Reimers & Schleicher (2020), the government has been trying to bridge the gap in the digital divide, but this has faced inadequacies in the provision of ICT equipment to schools and minimal support for the professional development of teachers. Munavu (2023) further found out that CBC is good for the country and that

there is support for it in the country, although there is a great desire to reform aspects of the delivery of the curriculum and its implementation to get desirable results. On the same note, aspects of ICT have stagnated, more so in public primary schools. This extends to parents and teachers in terms of poor internet connection and inconsistent power supply. It has been established that low ICT among teachers and, to an extent, parents, work together to weaken ICT. These challenges are more pronounced in rural schools, such as those in Nyamache Sub-County, where the vision of a digitally competent generation remains distant unless urgent intervention is undertaken.

Kenya has made some progress in multiple curriculum changes, which have faced delayed implementation. Researchers argue that this is due to resistance from teachers to adopt or implement the new curriculum, due to incompetence and inadequate training in ICT skills. According to KNUT (2023), most teachers are computer illiterate, and a few can only use a computer. The ongoing implementation of the competency-based curriculum has raised questions about teacher preparedness. According to Ondimu (2018), most teachers had received in-service training on CBC, but the frequency of the ICT training was low, implying that they may not be well-versed in the CBC. In the same study, most teachers wished to be trained in ICT, which has not been adequately done.

As an educator and researcher grounded in the realities of rural Kenyan schools, I recognise the critical role teachers play in realising the goals of CBC. Teachers in Junior Secondary Schools are navigating both opportunities and challenges in this transition. On one hand, CBC has increased student engagement through real-world applications of the skills (Karanja & Nyambura, 2020). On the other hand, teachers often struggle with limited training, increased workloads, and insufficient digital tools (Oluoch, 2019; Njogu, 2021). Yet, the potential of ICT to enrich learning remains immense, offering

avenues for interactive learning, access to global content, and enhanced communication (Mwangi, 2020).

However, unless teachers are fully equipped and supported, the promise of ICT integration in the CBC framework may remain unrealised. This is particularly true in rural areas like Nyamache Sub-County, where disparities in digital access and professional development are more pronounced.

Against this backdrop, this study investigates how Junior Secondary School teachers in Nyamache Sub-County are integrating ICT into instruction in the CBC framework. It seeks to determine instructional methods that teachers employed in integrating ICT in teaching and learning in the CBC framework in Rural Public Junior Secondary Schools within Nyamache Sub-County, Kisii, Kenya. Second, to identify gaps in teacher competencies for effective ICT integration in teaching and learning in the CBC framework. Third, to assess existing school infrastructure and resources for effective ICT integration in teaching and learning in the CBC framework. Lastly, to explore administrators' experiences on ICT integration in teaching and learning in the CBC framework.

The study aims to inform policy, improve practice, and contribute to ongoing national efforts to align education with the demands of the digital age.

1.2 Statement of the Problem

Integrating Information and Communication Technology (ICT) into teaching is widely recognised as a key driver of educational transformation, particularly in the Competency-Based Curriculum (CBC). Research highlights the benefits of ICT in enhancing learner engagement, promoting digital literacy, and supporting the development of 21st-century skills (Hennessy et al., 2005; Biasini & Proudfoot, 2018).

In Kenya, the CBC aligns with the country's Vision 2030 and Sustainable Development Goal 4 (SDG 4) by emphasising the acquisition of practical skills, including digital literacy.

However, despite these benefits, many Kenyan schools continue to face challenges in ICT integration. Studies indicate that teachers struggle to effectively incorporate ICT into instructional methods, often due to limited training and digital competencies (Munavu, 2023; Masika, 2019). Additionally, gaps in teacher preparedness hinder the seamless integration of technology into the CBC framework, raising concerns about whether students are truly acquiring essential digital skills. Beyond teacher capacity, the adequacy of school infrastructure and digital resources remains a critical barrier, particularly in rural areas (KICD, 2018; MoE, 2021). Recently established Junior Secondary Schools face even greater disparities in ICT access, making it crucial to research the ICT implementation status among teachers and administrators within their institutions.

To address these concerns, this study examines how teachers in Rural Public Junior Secondary Schools in Nyamache Sub-County integrate ICT into their instructional methods in the CBC framework. It further investigates the extent of teacher competencies in ICT use, assesses the availability and effectiveness of existing school infrastructure, and explores the experiences of school administrators in managing ICT implementation. By analysing these aspects, this research seeks to provide actionable insights for improving ICT integration and ensuring that the CBC's digital literacy objectives are effectively realised.

1.3 Purpose of the Study

The purpose of this study was to examine the integration of ICT in the teaching and learning process within the Competency-Based Curriculum (CBC) framework in rural public Junior Secondary Schools in Nyamache Sub-County, Kisii, Kenya.

1.4 Objectives of the Study

The study aimed to:

1. Investigate instructional methods that teachers employed in integrating ICT into the teaching and learning process in the CBC framework in the Rural Public Junior Secondary Schools within Nyamache Sub-County, Kisii, Kenya.
2. Examine gaps in teacher competencies for effective ICT integration into the teaching and learning process in the CBC framework.
3. Assess existing school infrastructure and resources for effective ICT integration into the teaching and learning process in the CBC framework.
4. Explore administrators' experiences on assessment of ICT integration into the teaching and learning process in Rural Public Junior Secondary Schools in Nyamache Sub-County, Kisii County, Kenya.

1.5 Research questions

The study sought to answer the following questions:

1. Which instructional methods do teachers employ in integrating ICT into the teaching and learning process in the CBC framework in the Rural Public Junior Secondary Schools within Nyamache Sub-County, Kisii, Kenya?
2. What are the existing gaps in teacher competencies for effective ICT integration into the teaching and learning process in the CBC framework?

3. What school infrastructure and resources are available to support ICT integration in the teaching and learning process in the CBC framework?
4. How do school administrators experience ICT integration in the teaching and learning process in Rural Public Junior Secondary Schools in Nyamache Sub-County, Kisii County, Kenya?

1.6 Significance of the Study

The significance of this study lies in its potential to inform educational policies on ICT integration in teaching, aid in the review of teacher training programs on ICT and contribute to curriculum development alignment to meet teacher concerns on ICT integration. This research aims to contribute practical recommendations for improving CBC implementation by examining the practices of Junior Secondary Schools teachers in Nyamache Sub-County. The findings will primarily be beneficial to teachers, as they recommend that the government provide more comprehensive training on CBC requirements. This study investigated the best practices that Junior Secondary Schools teachers used to address ICT challenges while implementing the Competency-Based Curriculum (CBC). It will offer valuable insights for education stakeholders by analysing how teachers navigate ICT integration. Greater teacher confidence in the curriculum is expected to result in better learning outcomes, aligning with CBC's core objectives. The study is anticipated to spark discussions and further research, particularly on the impact of ICT on CBC implementation.

1.7 Justification of the Study

Kenya's education system has faced criticism from educators, many of whom have sought further studies to improve teaching, learning, and curriculum implementation (CEMASTE, 2019). Understanding teachers' perspectives on ICT integration in the implementation of CBC is critical for achieving its objectives. Recently, Junior

Secondary Schools teachers have raised concerns about CBC demands, including inadequate ICT skills, insufficient retooling on CBC, work-related pressures, and heavy workloads (Munavu, 2023). Most of these teachers were trained under the 8-4-4 system, which placed minimal emphasis on integrating ICT into curriculum delivery.

This study focuses on Junior Secondary Schools in Kenya, as there is limited research on how Junior Secondary Schools teachers implement CBC. Munavu's (2023) report highlights that many teachers lack access to digital devices, hindering the integration of technology into learning. The report recommends that the Ministry of Education enhance ICT infrastructure at all educational levels to support curriculum delivery and assessment, improving ICT use among parents, teachers, and learners. However, it does not address the need for sufficient teacher retooling and training at the higher education and college levels.

Recently, teacher unions have expressed their dissatisfaction with insufficient retraining of teachers, technology challenges, harassment from heads of institutions, and other work-related stress (KNUT, 2024; KUPPET, 2024). Kenya National Union of Teachers (KNUT) has highlighted the need for substantial teacher training and professional development needs to ensure that educators are well-equipped to incorporate ICT effectively in their teaching practices. They emphasise that without adequate training, the objective of integrating ICT into the CBC framework may not be fully realised.

1.8 Limitations of the Study

This study utilised a mixed-methods approach to provide a comprehensive understanding of the ICT integration process in teaching. However, some potential limitations stood in the way. They included:

First, there was limited generalizability. Findings from a specific rural setting were not easily applicable to other regions or urban areas due to differences in resources, infrastructure, and teacher experiences. The study's results might not have fully represented the broader context of ICT integration across different geographical locations. Therefore, the study clearly defined its context and emphasised that the findings were most applicable to similar rural settings, while additional studies in diverse regions were needed to broaden the applicability of the results.

Another limitation involved resource constraints. Rural schools often had limited ICT resources and infrastructure, which could impact the consistency and quality of ICT integration practices. This variability in resources might have affected the findings and might not have reflected the best ICT integration scenarios. The availability of ICT resources in participating schools was assessed and documented to understand their impact. The data helped contextualise the findings and provided recommendations tailored to varying resource levels.

Additionally, variability in teacher experience was another potential challenge. Teachers' experiences with ICT integration varied significantly based on their level of training, familiarity with technology, and personal attitudes towards ICT. This variability could have made it difficult to draw uniform conclusions from the data. To address this, the study included a diverse sample of teachers with varying levels of ICT experience, and the data was analysed to identify patterns and differences based on experience levels.

To add to the above, response bias also affected the study, as teachers might have provided socially desirable answers in interviews or questionnaires, especially if they believed their responses could influence their professional evaluations or access to resources. This bias might have compromised the accuracy and reliability of the data.

To mitigate this, the study ensured anonymity and confidentiality in the questionnaires and interviews to encourage honest responses. Multiple data sources were used, and findings were triangulated to validate the results.

Finally, data collection challenges arose, particularly in rural areas, due to logistical issues such as transportation, communication difficulties, or limited access to technology for administering online surveys. These challenges were addressed by planning transportation and communication. Additionally, offline data collection methods or local facilitators were considered to assist with data gathering.

1.9 Assumptions of the Study

Key assumptions of the research included several important factors. First, regarding curricular intentions and goals, the study assumed that the goals and intentions of the digital literacy program in the CBC framework were accurately communicated and understood by Junior Secondary School teachers in the Nyamache sub-county.

A second assumption was implementation fidelity. It was assumed that the digital literacy program was being implemented according to the intended guidelines and principles of the Competency-Based Curriculum without significant deviations or modifications at the local level.

In terms of teacher understanding of competency-based education, the study assumed that Junior Secondary Schools teachers had a clear understanding of the concepts and principles of the digital literacy program as outlined in the curriculum.

Regarding policy consistency, this research assumed that education policies related to digital literacy programs under the CBC framework remained stable throughout the study, with no major changes that would influence teachers' ICT integration experiences.

Additionally, the research assumed that students were adequately engaged and prepared for ICT integration in the Competency-Based Curriculum, and their experiences aligned with those of the teachers.

1.10 Scope of the Study

The study focused on selected Rural Public Junior Secondary Schools in Nyamache Sub-County, Kenya. Current reports on ICT integration, such as Munavu (2023), indicate that private Junior Secondary Schools generally outperform public schools. The choice of Nyamache Sub-County is scientifically justified based on several factors: One, Nyamache represents a typical rural setting where the implementation of the Competency-Based Curriculum (CBC) and ICT integration face unique challenges such as inequity of ICT infrastructure, insufficient teacher training on ICT use, lack of reliable power supply and ICT storage facilities (Munavu, 2023), making it a relevant case study for broader issues across Kenya. Secondly, existing literature highlights similar rural areas struggling with teacher training and ICT resource allocation, aligning with this study's objectives to investigate and address these challenges (KICD, 2018)

The study focused on ICT integration in teaching, specifically examining instructional methods, teacher competencies, resource availability, and ICT utilisation in assessments in the Competency-Based Curriculum (CBC) framework. These elements are crucial to the success of the digital literacy program. Recent research highlights that ICT integration has not fully achieved its intended objectives, particularly at the lower primary level. With the introduction of Junior Secondary Schools in 2023, there is a pressing need to assess how effectively ICT is being integrated.

The study took place over approximately three months, coinciding with the first term of the school year, from January to April 2025. The study adopted a mixed-methods research approach and an explanatory sequential research design for data collection and

analysis. The study also embraced the pragmatic paradigm for a deeper understanding of the research focus. Lastly, the study employed in-depth interviews for Junior Secondary Schools Heads of Institutions and structured questionnaires for Junior Secondary Schools teachers.

1.11 Theoretical framework

1.11.1 Technological Pedagogical Content Knowledge (TPACK) Theory

The main proponents of TPACK are Punya Mishra and Matthew Koehler. They introduced the framework in their influential paper titled "Technological Pedagogical Content Knowledge: A Framework for Teacher Knowledge," published in 2006. TPACK was introduced in 2006 in a paper by Punya Mishra and Matthew Koehler.

Technological Pedagogical Content Knowledge (TPACK) is a framework that describes the knowledge, and skills teachers need to effectively integrate technology into their teaching practices. TPACK emphasises the intersection of three primary knowledge domains: Technological Knowledge (TK), Pedagogical Knowledge (PK), and Content Knowledge (CK).

TPACK recognises that effective teaching with technology involves more than just knowing how to use tools; it requires an understanding of how technology, pedagogy, and content are interconnected. The framework has been influential in shaping discussions and research on technology integration in education, providing a holistic view of the knowledge and skills needed by teachers to leverage technology for meaningful learning experiences.

In understanding the essential components of Technological Pedagogical Content Knowledge (TPACK), several key principles form the foundation of this framework.

1.11.2 Technological Knowledge (TK)

The framework necessitates a comprehensive understanding of available technologies and their functionalities. This involves not just familiarity with tools but a deeper awareness of how these technologies can be effectively employed in educational settings.

1.11.3 Pedagogical Knowledge (PK)

Integral to TPACK is a teacher's knowledge of effective teaching strategies, methods, and approaches. This encompasses a broader understanding of how to engage learners and facilitate meaningful educational experiences.

1.11.4 Content Knowledge (CK)

At its core, TPACK emphasises the necessity for teachers to possess in-depth knowledge of the subject matter they are teaching. This involves a profound understanding of the content, curriculum goals, and learning objectives.

1.11.5 Technological Pedagogical Knowledge (TPK)

TPK represents the point of convergence between Technological Knowledge and Pedagogical Knowledge. This critical intersection focuses on how technology can be purposefully applied to specific pedagogical approaches, ensuring a seamless integration of technology into teaching practices.

1.11.6 Technological Content Knowledge (TCK)

TCK emphasises the junction of Technological Knowledge and Content Knowledge. It underscores the importance of understanding how technology can effectively represent and communicate content, acknowledging the role of technology in shaping the delivery of educational content.

1.11.7 Pedagogical Content Knowledge (PCK)

PCK forms at the intersection of Pedagogical Knowledge and Content Knowledge. Here, the emphasis lies on the teacher's knowledge of how to teach specific content areas effectively. This involves a nuanced understanding of instructional strategies tailored to the subject matter.

1.11.8 Technological Pedagogical Content Knowledge (TPACK)

TPACK serves as the central nexus, uniting all three knowledge domains (TK, PK, CK). This comprehensive understanding signifies the knowledge and skills required to seamlessly integrate technology into teaching practices within a specific content area and pedagogical context. It underscores the dynamic interplay among technological tools, pedagogical strategies, and content mastery essential for effective teaching in the digital age.

The Technological Pedagogical Content Knowledge (TPACK) theory will be applied to address the study's research objectives as follows:

Objective 1: Determination of Instructional Methods Utilized by Teachers to Integrate ICT into Teaching and learning in the CBC Framework

This objective aligns with the application of the TPACK theory by examining how teachers leverage their Technological, Pedagogical, and Content Knowledge (TPACK) to integrate Information and Communication Technology (ICT) effectively into instruction within the Competence-Based Curriculum (CBC) framework. Specifically, the study will investigate how teachers' technological proficiency, pedagogical strategies, and understanding of the content intersect to inform their instructional practices involving ICT tools and resources. Through this lens, the research aims to uncover the nuanced ways in which TPACK influences teachers' approaches to ICT

integration in teaching, particularly in Rural Public Junior Secondary Schools within Nyamache Sub-County, Kisii, Kenya.

Objective 2: Identification of gaps in teacher Competencies Needed for Effective ICT Integration into teaching and learning in the Competence-Based Curriculum

Objective 2 focuses on identifying gaps in teacher competencies needed for effective ICT integration in the Competency-Based Curriculum (CBC), and it aligns closely with the TPACK (Technological Pedagogical Content Knowledge) theory. Through the TPACK framework, this objective explores the interconnectedness of teachers' technological, pedagogical, and content knowledge, aiming to uncover the specific challenges and barriers they face in integrating ICT into their instructional practices. By examining these knowledge domains and how they influence classroom implementation, the study seeks to reveal areas where teachers require targeted support, training, and professional development.

This objective is particularly relevant in understanding the extent to which teachers are equipped to design and deliver lessons that incorporate digital tools in a way that enhances content mastery and aligns with pedagogical goals under the CBC. Ultimately, by identifying these competency gaps through a TPACK-informed lens, the study intends to recommend strategies for building teacher capacity and improving the overall effectiveness of ICT integration in Junior Secondary Schools classrooms.

Objective 3: Assessment of school infrastructure and resources for ICT Integration in teaching and learning in the CBC framework

Objective 3 focuses on assessing school infrastructure and resources for ICT integration in the CBC framework, and it aligns with the TPACK (Technological Pedagogical Content Knowledge) theory by highlighting the foundational support required for

effective technology use in education. Through the TPACK lens, this objective emphasises the role of adequate infrastructure and resource availability in enabling the integration of technology with pedagogy and subject content. By examining the state of digital tools, internet connectivity, power supply, and administrative policies in rural public Junior Secondary Schools, the study seeks to understand how these factors influence teachers' ability to apply TPACK in their instructional practices. The objective further explores how administrative decisions regarding resource allocation, maintenance, and professional development needs either facilitate or hinder the integration process. Therefore, by assessing infrastructure and resources through the TPACK framework, the study aims to uncover gaps and propose strategic interventions that can empower educators to deliver technology-enhanced, competency-based education effectively.

Objective 4: Administrators' experiences with ICT integration in teaching and learning in the CBC framework, Rural Public Junior Secondary Schools

Concerning Objective 4, the TPACK (Technological Pedagogical Content Knowledge) framework provides a valuable lens for exploring administrators' experiences with ICT integration in teaching within rural public Junior Secondary Schools. Administrators play a critical role in supporting teachers to develop and apply TPACK by facilitating professional development, providing ICT resources, and creating an enabling environment for the effective integration of technology into pedagogy and content delivery. Their experiences reflect how they navigate the complexities of technological, pedagogical, and content knowledge to support teaching and learning in the Competency-Based Curriculum (CBC). Specifically, administrators influence teacher preparedness through targeted capacity-building initiatives, policy formulation, and monitoring mechanisms aligned with TPACK components. In resource-constrained

rural settings, their leadership in managing change, addressing infrastructural challenges, and promoting a culture of innovation is vital in ensuring that technology use is meaningful and pedagogically sound. Thus, examining their experiences through the TPACK framework reveals how their decisions and actions shape the overall effectiveness of ICT integration in teaching and learning in the CBC framework.

1.12 Conceptual Framework

Independent Variables: ICT integration in teaching and learning

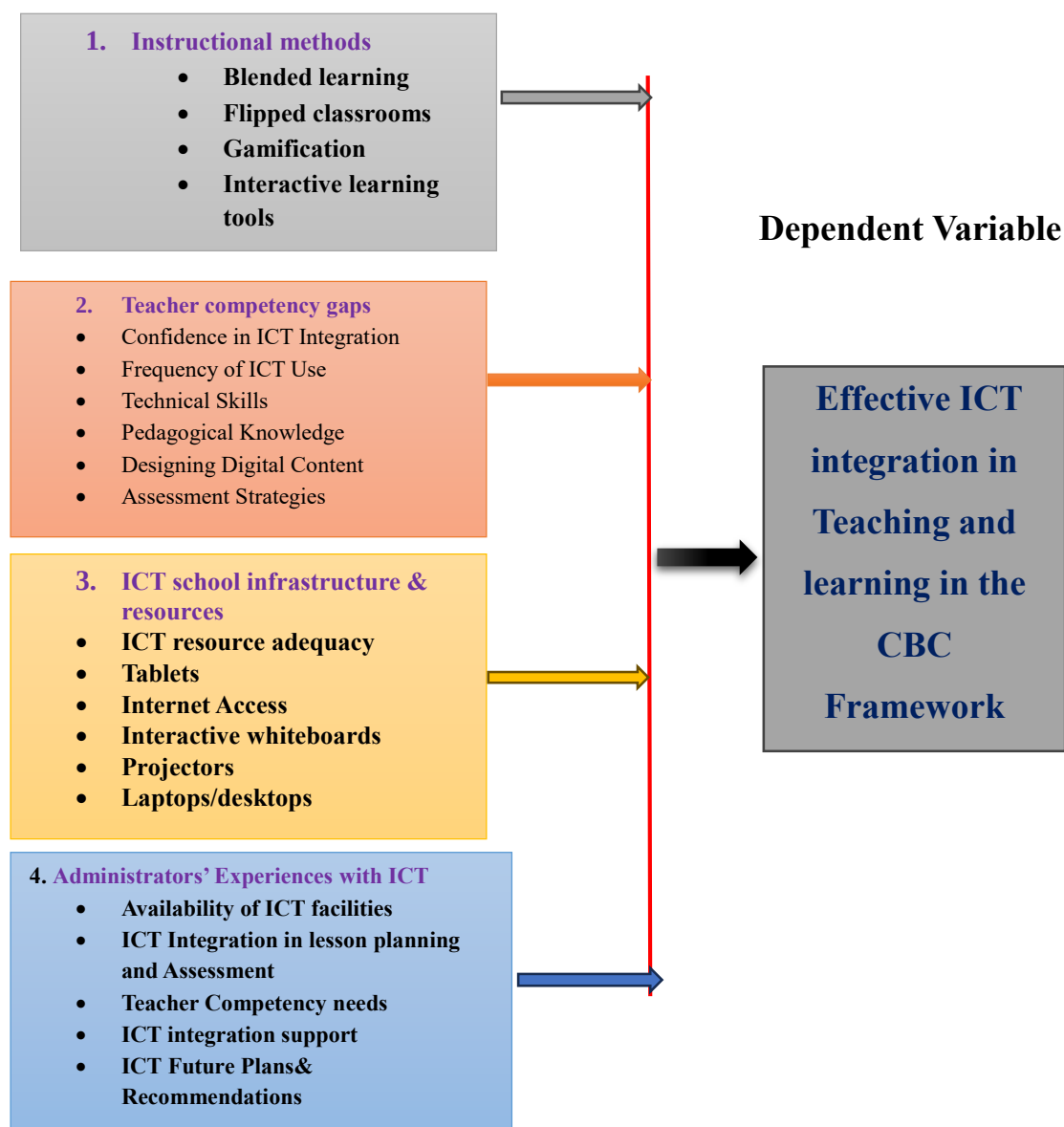


Figure 1. 1 Conceptual Framework

Source: Researcher (2025)

1.13 Operational Definition of Terms

Competence-Based Curriculum (CBC)-Refers to an educational approach focused on the development and application of practical skills in real-life situations, rather than relying solely on the memorisation of content.

Junior Secondary Schools- Junior Secondary Schools cover grades 7, 8, and 9 in the CBC framework. These grades are typically housed in former primary schools, now known as comprehensive schools, which accommodate both Junior Secondary Schools and primary levels.

Learning Institutions Encompass educational facilities such as Early Childhood Development and Education (ECDE) centres, primary and secondary schools, vocational training centres, technical colleges, training institutes, polytechnics, and universities.

21st Century Skills-Refer to the abilities that today's learners need in their careers during the information age. They include critical thinking, creativity, communication, collaboration, digital literacy, and innovation.

Information and Communications Technology (ICT)- Includes communication devices and applications such as tablets, projectors, smart screens, mobile phones, computers, as well as services like video conferencing and distance learning.

ICT Infrastructure- Refers to the hardware and software systems used in education for administrative, management, and instructional purposes.

ICT Integration in Education - Is the seamless incorporation of digital technologies to support and enhance the achievement of curriculum objectives, fostering the development of competencies in knowledge, skills, attitudes, and values, and improving the management of education at all levels.

Effective ICT Integration- In the context of teaching under the CBC refers to teachers' ability to effectively use digital tools and technologies to enhance teaching and learning. It involves the purposeful integration of digital resources to create engaging, inclusive, and effective learning environments.

Teacher ICT Competencies- Refer to the demonstrated ability of junior secondary school teachers to effectively select, integrate, and apply ICT tools and resources in their teaching practice. This includes skills in operating hardware (computers, projectors, and mobile devices), using educational software, applying digital literacy in lesson design, as well as the capacity to troubleshoot basic technical problems and evaluate ICT tools for instructional relevance.

Retooling- Involves re-training teachers, either those already in the profession or new entrants, to improve their Technological Pedagogical Content Knowledge (TPCK), especially in the use of ICT in teaching.

In-service Training- Is professional development provided to employed educators to enhance their skills and competencies.

Digital Learning Resources- Refer to materials that support learners in achieving curriculum objectives. These include a range of media such as graphics, images, audio, videos, simulations, animations, and programmed learning modules.

Integration Experiences- Refer to the encounters, reflections, challenges, and coping strategies teachers face while implementing the CBC during the instructional process.

School Infrastructure and Resources- In this study denotes the physical and technological facilities available in junior secondary schools to support ICT integration into instruction. This includes ICT equipment (computers, laptops, tablets, projectors, and speakers), electricity and internet connectivity, physical classrooms, computer

laboratories, furniture, instructional materials (e-books, educational software), and other teaching and learning resources that enable ICT use.

Instructional Methods- Refer to the specific strategies, techniques, and approaches that teachers in junior secondary schools use to deliver content and facilitate learning in line with the CBC. This includes traditional techniques (such as lectures and question-and-answer sessions) and ICT-based strategies (such as multimedia presentations, computer-assisted learning, and use of educational apps) intended to enhance learner engagement and improve learning outcomes.

Administrators' Experiences with ICT Integration-Refer to the perceptions, practices, challenges, and observations of school administrators (such as headteachers, deputies, and senior teachers) in implementing, supporting, and overseeing the use of ICT tools and methods in teaching and learning in junior secondary schools. It encompasses their administrative decisions, resource allocation, leadership support, capacity-building efforts, and policies that influence the adoption and sustainability of ICT-based instructional strategies.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This study investigates the integration of Information and Communication Technology (ICT) in the implementation of the Competency-Based Curriculum (CBC) among Junior Secondary Schools in Nyamache Sub-County, Kenya. Utilising a mixed methods approach, the research focused on four specific objectives. First, it aims to determine the instructional methods employed by teachers in integrating ICT teaching in the CBC framework. Second, the study will identify gaps in the teacher competencies necessary for effective ICT integration in the curriculum. Third, it will assess existing school infrastructure and resources to facilitate effective ICT integration in teaching under the CBC framework. Finally, the research will explore administrators' experiences with ICT integration during teaching and assessment in Rural Public Junior Secondary Schools. Through these objectives, the study seeks to provide comprehensive insights into the effectiveness of ICT integration in the CBC and the various factors that influence its implementation.

2.1 Concept of ICT in CBC Implementation

The Basic Education Act, 2013, section 95(3)(k) advocates for the development, management, promotion and governance of the education sector through the integration of ICT. Therefore, the policy provides a guideline that promotes the utilisation of ICT in running educational institutions. Integrating ICT into the Kenyan education system is an effort to actualise Article 43(1)(f) of the Kenyan Constitution, which provides that every Kenyan has a right to free and compulsory education.

The integration of ICT in education, training, research, and management, teaching and learning at all levels of education is called for in the Sessional Paper No.1 of 2019,

which provides for the use of ICT in changing education. This paper asserts that there is a need for inclusion in the acquisition of infrastructure meant for ICT, training, adaptation of digital content and security and management of ICTs for learners and trainees with special needs. In 2013, the KICD Act provided for the development, evaluation and dissemination of curriculum and curriculum support materials, including digital learning resources. The policy focuses on the promotion of the utilisation of ICT in curriculum development, implementation, evaluation and assessment (KICD,2013)

The Africa Agenda (2063) emphasises the need for Africa to revisit and adapt its development agenda to meet the changing global contexts, for instance, the CT revolution. The policy lays open strategies to promote the capacity of policymakers and education administrators to integrate ICT in education, training and management. This agrees with Kenya's Vision 2030, which aims at transforming Kenya into an industrialised middle-income economy through embracing ICT in education and training. However, this has not been fully met as there exist challenges with professional development needs among teachers.

Integrating ICT into teaching and learning in primary schools offers numerous benefits, including enhanced student engagement and the development of critical 21st-century skills. According to Hennessy, Ruthven, and Brindley (2005), the use of ICT in classrooms significantly improves student motivation and engagement by making learning experiences more interactive. Voogt and Knezek (2008) emphasise that ICT integration supports the development of essential skills such as problem-solving, collaboration, and digital literacy, which are crucial for success in the modern world.

Competence-based curriculum emphasises the development of digital skills, knowledge, and core competencies in learners' real-life situations in Kenya. According to Biasini and Proudfoot (2018), a study in Italy on the digital world noted that

integrated information communication and technology may be incorporated in all the learning areas in the competence-based curriculum during lesson assessment, where a teacher may use ICT through learning experiences using text, animations, and videos. Another study in the United Kingdom by Pritchett and Beatty (2015) on matching curricula to student skill levels, reviewed that Knowledge of the rationale underpinning ICT includes manipulation of educational environments.

A study by Özdamar and Keskin (2015) examining ICT competencies and learning habits of open and distance learners suggested a blending of technical and organisational capabilities with personal teaching creativity, management, flair, and style. Digital competence-based teachers require school managers to know how best teachers teach and manage learning through digital technologies, focusing on Effective and engaging teaching performance, resources, class management and organisational approaches, and appropriate learning design. Broadband Commission (2017) established that the ICT programs devices in schools, such as competence-based teacher digital devices, competence-based learner digital devices, digital content servers and wireless routers, and external hard disks, contain content that is being integrated into the learning process and management.

Technology use in implementing the CBC, assessment, and delivery is a continuously growing trend and new normal. Trends in education have emerged and triggered a rise in the population of learners using technology and e-learning sign-ups. The education calendar was disrupted in 2019 due to COVID-19, and this led to a robust increase in digital content use, which was available to learners and teachers (Munavu, 2023).

ICT competence emphasises understanding digital technology in classroom management. Hooker's (2017) study at Queen's University Belfast on the implementation of the strengthening innovation and practice in secondary education

initiative, reviewed that the potential for new educational technologies is the key to delivering individualised education cost-effectively. The competence-based teacher's digital understandings support efforts to plan and structure learning programs to foster relevant competencies in learners. Technological competence focuses more on theoretical understandings related to the role and potential of digital technologies in teaching and learning management. Çam and Kiyici, (2017) studied the perceptions of prospective teachers on ICT and asserted that competence-based classroom teachers in technology drive competency-based models; they primarily work independently, guided by an online curriculum offering standardised digital learning progressions with aligned computerised assessments to promote curriculum delivery and management. According to the Ministry of Education, Science, and Technology (MOEST), Kenya (2022), ICT should be incorporated into learners' learning and management of their learning activities.

According to a research report by Kathenya & Mbaka (2022), in their study on the relationship between competence-based ICT concepts and the management of primary school curriculum implementation, there were suggestions to the Ministry of Education to promote ICT technologies for efficient curriculum implementation in primary schools in Kenya. Gioko & Waga (2019), in their study on ICT enhancement status in Kenya's Competence-Based Curriculum, revealed that despite the deployment of devices to schools, the implementation of ICT remains very low, and there is a need to interrogate possible factors for this low implementation beyond devices and educator preparation with virtual support. This study recommended that schools should increase the utility of the devices in their pedagogy and that there is a need for a qualitative study to address the needs of teacher support in establishing aspects that inhibit their ability to enhance ICT.

A report by the Presidential Working Party on Education Reforms on Educational Reforms, Munavu (2023) in Kenya sought stakeholder views on the implementation of CBC, and the findings were as follows: First, stakeholders recognised CBC as valuable in equipping learners with skills in collaboration, new pedagogy, community engagement, and parental involvement. However, concerns were raised about challenges of internet and electricity connectivity, which negatively affected ICT and low literacy and numeracy levels for foundational learning. Issues of teachers having to handle many learning areas were brought forward.

2.2 Instructional methods for ICT integration in the Competence-Based framework.

Integrating ICT resources in teaching within a digital literacy program offers multifaceted benefits that enhance learning and engagement. Interactive whiteboards like SMART Boards allow educators to display and interact with digital content, enriching lessons with videos and interactive games. Learning apps such as Duolingo, Babbel, and Memrise use gamified lessons and mnemonic techniques to make vocabulary acquisition more engaging. Online learning platforms like Moodle, Edmodo, and Khan Academy provide comprehensive tools for creating quizzes, courses, and interactive activities, fostering a collaborative learning environment. Digital libraries and eBooks, including Project Gutenberg and Oxford Owl, offer a wide range of reading materials for different proficiency levels, making literature accessible and varied. Multimedia tools like YouTube and podcast platforms, alongside online collaboration tools such as Google Classroom and Microsoft Teams, further enhance the learning experience by incorporating diverse instructional methods and facilitating communication between teachers and students.

The use of Virtual Reality and Augmented Reality technologies, such as Google Expeditions and Mondly Virtual Reality, creates immersive learning experiences that enhance vocabulary acquisition and contextual understanding. Speech recognition software, including Rosetta Stone and Google Assistant, provides essential practice for pronunciation. Meanwhile, grammar and writing tools like Grammarly and Hemingway Editor offer real-time feedback and suggestions for writing enhancement. Educational games and gamified learning platforms, such as Kahoot! and Quizlet, make learning an enjoyable and interactive experience. These Information and Communication Technology resources accommodate diverse learning styles, offer flexibility for self-paced learning, and provide immediate feedback, which is crucial for learning. By integrating these tools into a digital literacy program, the study not only enhances Teaching but also improves students' overall digital literacy, creating a more engaging and effective learning environment (Oluoch, 2019; Kinyanjui, 2018).

According to Häkkinen et al. (2020), in Finland, pre-service teachers must develop their skills to address the changes that happen now and in the future in the education field or work life. Teachers are already involved in the education world; they have different styles of teaching, and the interpretation of “quality teacher” has similarities in every culture.

The research conducted by Gelmez Burakgazi et al. (2019) sought to identify the pre-service teachers for 21st-century learning in Turkey. The result revealed that pre-service teachers in the 21st century had excellent competence levels, and proficiency in a foreign language had a significant effect. In other words, based on these criteria, pre-service teachers can incorporate digital technology in the learning process. In addition, the result shows that the pre-service teacher has the motivation to develop the knowledge and skills for digital technology adaptation in the modern world (Pozas &

Letzel, 2021). ICT skills are needed to be used with digital technology according to the applied rules.

In a study conducted by Jemutai and Kafwa (2023) on building ICT and perspectives of pupils' play-way methods of learning in primary schools established that the play way method of learning was employed. The study further asserted that primary school pupils' digital literacy competencies were demonstrated through the play-way method as facilitated by teachers. These included: Manipulating the tablet's menu, which guided the navigation skills. Secondly, the pupils could find digital content that enables them to develop search skills and reading attitudes.

Asava (2021) sought to find out various pedagogical practices employed by grade four teachers in implementing CBC and established that group discussions were employed, but not to a great extent, as done in upper classes. According to this study, most of the teachers used the role-play method to integrate ICT. However, few teachers use simulations, and there were recommendations to train teachers to achieve the objectives of CBC. He also assessed the influence of teacher pedagogies on the implementation of CBC and established that most teachers agreed that the adoption of communication strategies, learner-centred methods, and practical strategies impacts CBC implementation. This study further recommended that more computer labs need to be set up and equipped with digital tools, and this did not leave out relevant infrastructure like electricity and internet.

In a study conducted by Nyaboke, Kereri, and Nyabwari (2021), they found that most teachers needed 21st-century skills, especially in pedagogical approaches in the CBC implementation. The study concluded that there must be regular training regarding developing pedagogical knowledge on technology use and how it should be incorporated into teaching ICT.

In a study by Kerkhoff & Makubuya (2021), the grades 1–4 focus group shared their perceptions that by “having children come up with stories on their own,” digital storytelling could promote learners’ “creativity and critical thinking.” In the end, they asked teachers if they believed that digital storytelling would be a culturally relevant way to teach ICT. An overwhelming 91% of survey participants believed that digital storytelling would qualify as a culturally relevant teaching method. One participant enthusiastically stated on the survey, “Awareness of digital storytelling should be created among Kenyan learners.” Because of the challenges, teachers reported that there is a need to be creative to integrate technology into their literacy classes. Two creative solutions were having students work in groups and using personal smartphones, as such phones are more plentiful in Kenya than computers (Muigai & Mantz, 2019). An early childhood teacher imagined showing videos of animals on her phone so that students could see and hear what different animals sound like.

In addition to this, Kerkhoff et al. (2021) reported that creating digital multimodal compositions in school is motivating for students, and this agrees with a study conducted by Alvermann (2002; Heinrich et al., 2020). One reason is that digital platforms provide students with opportunities to share multimodal compositions with authentic audiences. Students can apply their ICT in storytelling and activist spaces online, making ICT an important part of civic and community life, in addition to career preparation (Lee, Meloche, Grant, Neuman, & Tecce DeCarlo, 2019; Lewis Ellison, 2017; Nixon, 2013). Nixon (2013) described collaborative digital storytelling as a meaningful practice to explore issues of identity, such as race and gender, and to bridge storytellers’ home literacies to school literacies.

Research by Otieno (2021) on integrating ICT in the implementation of CBC found that the use of technology requires equipping teachers with new pedagogical competencies

and new approaches to teacher education. Teachers should be more aware of the goals of CBC and identify various areas of the reforms that are related to these policies. Omboto, Kanga & Njageh (2022), in their study on ICT implementation in primary special schools, established that most of the learning materials in the market are not adapted, making it a challenge to access appropriate and specialised teaching and learning materials for learners and trainees with disabilities. Further, this limits the teacher in employing a variety of content in teaching and learning activities for effective curriculum delivery. For an institution to fully integrate information and communication technology into its learning, there should be resources that fully support the integration.

In research conducted in coastal Kenya, Jukes et al. (2017) found that teachers relied on teaching from textbooks with “lecture and whole-class oral pedagogies” (p. 451). Ngware, Mutisya, and Oketch’s (2012) mixed-methods study of schools in Kenya found that teaching styles varied across instruction and that engaging students in recitation, in which students were active participants but not constructing knowledge, was the most common teaching activity. The researchers found that other, more learner-centred practices, such as discussions in which students co-constructed knowledge, were theoretically helpful for student learning but comprised less than 4% of total teaching activities in the lessons observed. Ngware and colleagues summarised their findings as follows: “This implies a heavily teacher-centred and reproductive style that may not develop critical thinking among learners” (p. 47).

A KICD report stated that most teachers had not embraced technology in teaching practice: “This was interpreted as either unwillingness by teachers to integrate ICT [information and communication technology] in the learning process or a lack of capacity to do it” (as cited in Wanzala & Nyamai, 2018, para 13). In addition to the

challenge of accessing technology, research in Kenya (e.g., Heinrich, Darling-Aduana, & Martin, 2020; Kerkhoff, Spires, & Wanyonyi, 2020) has shown that even when schools have the technology, challenges persist, mirroring those faced by other developing countries.

In a study by Hassan (2024), he noted that educators should adopt flexible pedagogical strategies that blend traditional teaching methods with innovative ICT-based activities to cater to diverse learning preferences and styles. Establishing collaborative relationships among educational stakeholders, including educators, policymakers, and technology experts, can facilitate knowledge exchange and the dissemination of best practices. Additionally, regular assessment and feedback mechanisms should be implemented to evaluate the effectiveness of ICT integration in curriculum implementation, allowing for ongoing improvements based on actual data.

2.3 Professional Development Needs for Effective ICT Integration in the Competence-Based Curriculum (CBC).

The Ministry of Education policy on ICT integration and training provides for the promotion of professional development needs of teachers, trainers, tutors and lecturers on the use of ICT in teaching and learning at national and county levels. The objective of this policy is to enhance the capacity of teachers, trainers, tutors and lecturers to facilitate the use of ICT in teaching and learning across all levels. The strategies to effect this include: reviewing teacher education curriculum to include use of ICT in curriculum implementation and assessment of consideration of trainees in special needs education across all levels: Enhance the capacity of in-service teachers, trainers, tutors and lecturers on the use of ICT in education and training: Enhance the capacity of educators on innovative pedagogical approaches and technologies for continued learning, and establish mechanisms for online professional development for education

managers,(MoE,2021). However, a report by the Presidential Working Party on Education Reforms indicated that little has been done to affect these policies within three years (Munavu,2023).

The MoE further has a policy on the promotion of the use of ICT in education and training through research and innovation. One of the goals of the MoE policy on research and innovation is to support the use of ICT in education and training through research and innovation. This will ensure: the promotion of research and innovation in the use of ICTs for curriculum development, implementation and assessment: The promotion of creativity and innovation in use of ICT in education and training: Access to equitable and inclusive education and training through research and innovation in ICTs and facilitation of research and innovation in the use of ICTs for management of data in education and training.

Integrating ICT in teaching within a digital literacy program necessitates several key competencies for educators to effectively enhance learning and student engagement. Technical proficiency is fundamental, requiring teachers to skilfully operate interactive whiteboards, learning apps, and online platforms while troubleshooting technical issues and staying updated with new technologies (Mukhwana, 2020). Pedagogical skills are equally important, enabling educators to design lessons that incorporate digital resources, create interactive activities, and adapt traditional teaching methods to digital formats (Oluoch, 2019). Digital literacy is crucial as it involves teaching students to navigate digital platforms, evaluate online resources, and use digital tools for research and learning (Kinyanjui, 2018). Additionally, communication and collaboration skills are vital for using ICT tools like Google Classroom and Microsoft Teams to facilitate interaction and teamwork among students, emphasizing online etiquette and digital citizenship (Wanyama & Mbugua, 2021).

Content creation and curation skills help teachers design multimedia presentations and interactive quizzes, tailoring lessons to students' needs (Njagi & Wanjohi, 2020). Effective assessment and feedback using ICT, through platforms like Moodle and Kahoot, are critical for tracking progress and providing constructive feedback (Munyua, 2017). Furthermore, cultural and ethical awareness ensures digital inclusivity, data privacy, and the responsible use of technology, which are essential in the educational context (Ochieng, 2018). Lastly, adaptability and lifelong learning are necessary for educators to continuously update their ICT skills and integrate new technologies into their teaching practice (Kimani, 2019). Developing these competencies enables educators to create a more engaging and effective learning environment, ultimately enhancing students' digital literacy.

As much as teachers are required to implement the CBC curriculum, they are faced with a myriad of challenges, especially in the co-competence of digital literacy, which requires them to be ICT-compliant. Studies that have been done so far on teachers' use of ICT in implementing the CBC in public primary schools have established that the objectives of ICT have not been fully met. For instance, a study by Muriithi & Yoo (2021) asserts that shared devices like projectors, sockets, and extension cables were not available in most public primary schools. This is a threat to the integration of ICT in teaching and learning. It was also established that learners had high access to tablets and laptops and that the power supply was reliable. The bigger challenge that was identified is the lack of ICT integration skills by teachers to be able to assess the learner's use of technology in instruction. The study found a high number of teachers who have attained technology skills, but the challenge is in the gaps in the pedagogical applications in actual teaching. It was also found that teachers do not integrate ICT into their lessons.

Masika (2019), in his review concerning CBC preparedness in Kenya, asserts that most of the teachers' level of digital literacy is below average, yet this is a core competence that learners are supposed to learn, begging the question of what will happen in that specific area.

A study by Koskei & Chepchumba (2020) on teachers' competency in CBC implementation in lower schools in Nakuru County revealed that there is a need to train facilitators and trainers and embrace consistent training sessions and re-training of teachers for efficient integration of ICT in teaching and learning adequately and effectively. According to Munavu (2023, p.32-36), in a report submitted to the president, the 5th president of Kenya, on educational reforms, teachers and learners have low ICT, especially in public schools where power and internet connectivity are very low in the Northern parts of Kenya. It was found out that the cost of digital devices is high, limiting access to digital content. The report further asserts that there was poor internet connectivity, inconsistent power supply, and a lack of digital or faulty devices.

In their 2019 study on the implementation of a laptop initiative in public primary schools, Muinde and Mbataru discovered that 68.5% of the surveyed teachers had a positive view of using laptops in education. Despite this, they noted that 39% of the teachers felt that the time allotted for integrating technology was insufficient, with a significant portion of lessons being spent on setting up the devices. Such challenges can lead to resistance among teachers toward the use of ICTs in their teaching, especially if they believe it demands excessive time and effort (Omwenga et al., 2004).

Similarly, Heinrich et al. (2020) explored the potential and necessary conditions for effective tablet integration in rural Kenya. Through a mixed-method approach involving classroom teacher interviews, student surveys, and focus groups, they found that teachers frequently excluded students who were perceived as slow learners during

technology integration. Some teachers reported that they could not address the needs of academically struggling students due to the limited time available in each lesson. The study emphasises the need for more professional development for teachers to enhance their pedagogical skills, enabling them to support all learners, including those with disabilities, in a technology-rich classroom.

According to a study on perceptions of teachers on ICT and transformative literacy teaching conducted by Kerkhoff & Makubuya (2021), teachers reported using technology for teaching preparation and keeping records rather than engaging students in digital literacy practices on professional development on ICT and transformation teaching in rural Kenya. They also identified Infrastructure problems that consist of electrical and internet outages, and this agrees with what other scholars found (Muriithi, Horner, & Pemberton, 2016; Richardson, 2011; Stols et al., 2015). In the one-on-one interview, a middle-grade English and science teacher stated that it is typical for schools to have 80 students in a class and only five computers at the school. She proposed stations (e.g., what was modelled in PD breakout sessions) and teamwork (modelled in Design Studio) as a strategy to overcome the challenge of a few computers.

In her study, by Njagi, (2020) on teacher preparedness in CBC implementation, Njagi (2020) reported that a large percentage of pre-primary school teachers indicated a level of agreement with the fact that most pre-primary institutions had been furnished with adequate computers to facilitate learning. Most of the teachers agreed that they have been trained in ICT with a competency-based Curriculum. However, the results of the data analysis revealed that teachers needed a lot of support in infusing core competencies, whereas forty per cent needed support in infusing communication and collaboration.

According to the findings, only a small percentage of teachers (8.0%) reported having limited exposure to Information and Communication Technology (ICT) tools and knowledge of their usage. This finding is particularly notable given the multiple ICT training sessions conducted by the Teachers Service Commission and the Ministry of Education before and during the implementation of the Competency-Based Curriculum (CBC). While teachers rated their perceived ICT knowledge and skills as moderate, it was evident that their perceived efficacy in integrating ICT was low. Therefore, further research into their integration practices and challenges is essential to understand the factors influencing their experiences.

In a study conducted by Abdullahi (2019) regarding the availability of ICT and audio-visual equipment in public preschools in the Garissa sub-county, it was found that 46% of teachers disagreed with the availability of ICT equipment, while 60% disagreed regarding audio-visual equipment availability. Additionally, 19% of teachers were unaware of the existence of such resources in their schools. These findings underscore the necessity of investigating specific pedagogical approaches and practices related to ICT integration during the implementation of the CBC.

When the actual use of ICT in class was measured, the results were similar. Most teachers were not using technology to deliver content most of the time. However, an overwhelming majority (84.69%) believed that the integration of ICT into teaching and learning was very important. It influences the implementation of CBC positively as the curriculum is digitally based. The Heads of Institutions also agreed that most teachers were not using technology to deliver their lessons. They attributed this to a lack of ICT facilities in the schools. This implies that the facilitation and delivery of the curriculum will be derailed due to a lack of teachers' exposure to ICT and inadequate technological skills.

Research on professional development, ICT, and K-12 teachers is recent and less definitive than most research on professional development because technology is continually changing (Corcoran, 1995; ISTE, 2000; Jones, Valdez, Nowakowski, & Rasmussen, 1995; Milken Exchange, 1999; Mousund & Bielefeldt, 1999; NCATE, 1997). The notion of professional development has been understood to mean activities that enhance an individual's professional growth. Most recently, the definition of professional development has been extended to include technology as a means for enhancing a teacher's professional growth. As Grant (2000) suggests, the definition of professional development includes support for teachers as they encounter the challenges that come with putting into practice their evolving understandings of the use of technology to support inquiry-based learning. Current technologies offer resources to meet these challenges and provide teachers with a cluster of support that helps them continue to grow in their professional skills, understanding, and interests. However, this research focused on K-12 teachers, and there is a need to research Junior Secondary Schools teachers' professional development.

The challenge of preparing educators for 21st-century teaching affects both preservice and in-service teachers as both teams end up meeting the ICT need whether they were trained or not during their undergraduate studies or even after graduating (Syomwene, 2021). Carey and Worthington (1997), in their studies of classroom uses of technology indicate that 90% of K-6 teachers use technology with their students and 52% have computers in their classrooms. In observing time on tasks, however, it appears that, on average, students spend 2.9 hours playing games and 3.4 hours on drill-and-practice activities. More meaningful and engaged uses of technologies are not evident. One reason for this pattern of use is suggested by the United States Department of Education's National Center on Educational Statistics which observes that: Teachers are

being asked to learn new methods of teaching, while at the same time [they] are facing even greater challenges of rapidly increasing technological changes and greater diversity in the classroom. Teachers (approximately 20%) report feeling well-prepared to integrate educational technology into classroom instruction. (United States Department of Education, 1998).

Most teacher preparation programs are falling short. Teacher education faculty do not use technology much in their teaching and research. They have an insufficient understanding of the demands of classroom teachers to incorporate technology into their teaching. Preservice teachers are given instruction on computer literacy and shown software but rarely are required to apply technology in their courses and are denied role models of faculty using technology in their work. (NCATE, 1997).

Based on the research, several features are crucial to the successful implementation and integration of technology in the Junior Secondary Schools classroom, the least of which is ensuring that teachers are digitally literate. These features include support, especially administrative support, time for teachers to learn new skills and explore how technology skills may be integrated into their curriculum, access to up-to-date resources, and the development of a community of teachers working with technology. Additionally, for professional development to be successful in enhancing ICT, teachers must recognize and use potential links to their curriculum and understand how technology may enhance learning and instruction.

ICT will prevail when teachers address the pedagogical changes that may be necessary with the implementation of technology in the classroom. Ensuring that teachers are technologically literate promises opportunities for students to gain literacy, numeracy, creativity, equality, and responsibility. Studies conducted assert that ICT literacy has made significant progress in addressing society's need for technologically literate

citizens through efforts to ensure ICT competency among both preservice and in-service teachers, but the journey remains in its early stages. Technology changes too rapidly and with such great force that it is difficult to accurately determine what is working for teachers in terms of technology and what is not.

2.4 Assessment of existing School infrastructure in the CBC framework

School infrastructure is a central element of ICT in education and training, and the government has made significant investments in providing ICT infrastructure, particularly in power and fibre optic connectivity across the country. This has been further catalysed by the commencement of the Digital Literacy Programme, which has increased access to ICTs in educational institutions. However, the number of computers, tablets, and projectors remains inadequate amid the high cost of internet connectivity (MoICT, 2021).

For effective integration of ICT in education, there should be sustainable and equitable access to ICT infrastructure by teachers and learners. The issue of access to ICT is determined by factors such as the high cost of purchasing ICT infrastructure and equipment, access to cheaper internet connectivity, low internet connection in rural areas in the country, limited access to sustainable electricity, insecurity, ethical concerns, negative attitude and lack of awareness, (MoE,2021).To address these challenges, the MoE shall facilitate the acquisition of quality, relevant, and adequate ICTs across all levels of education, provision of affordable internet connectivity to educational institutions, and provide linkages within various levels of education and training among other solutions.

ICT resource availability regarding ICT integration encompasses the provision of ICT equipment like computers, laptops, and tablets. Additionally, the provision of internet connectivity through routers, and training of teachers tasked with integrating ICT into

teaching is the role of administrators like the Teachers Service Commission, Ministry of Education, School management, and parents. Byrom (1998) furthers the issue of support for teachers as a key feature in gaining proficiency with technology by suggesting that administrative support is instrumental in the effort to get teachers to integrate technology.

In a review article by Masika (2019), he analyses the CBC preparedness in Kenya and recommends that the implementation of the CBC cannot succeed with the current teacher shortages. As of the end of 2019, the teacher shortage in Kenya's primary schools stood at 37,643, while that in secondary schools was 49,750 (Wanzala, 2019). The CBC requires at least three teachers per class for effective implementation. There is a need to hire more teachers to effectively implement the CBC. Most public primary schools continue to struggle with over-enrolment and understaffing, which affects the effective implementation of the CBC. The Teachers Service Commission (TSC) should improve staffing levels in schools to ensure the effective implementation of the CBC. Schools with at least two teachers for every lower primary grade will have optimum class sizes, making CBC implementation easier and more successful.

Munavu's (2023) report found that one of the challenges of past e-learning programs was the provision of ICT equipment to educational institutions with little or no support for teachers' professional development (Reimers & Schleicher, 2020). At the Pre-Primary level, there are several functional computers and tablets available for educational use. The technology infrastructure in terms of computers and tablets, as well as functional internet connectivity in Pre-Primary with public schools having 95,722 computers/tablets and private schools having 24,320. However, internet connectivity in public and private schools was 14.9% and 44.5%, respectively, according to the Ministry of Education [MoE] (2021). This reveals that despite public

schools having more computers and tablets, there is very low internet connectivity, which makes it challenging for teachers to integrate ICT; hence, the focus of this study is to navigate the experiences of the same teachers. Regarding power connectivity, 82% of public Primary schools were connected to electricity through the national grid and 14% through solar energy under the Digital Literacy Programme (DLP) MoE (2020). Therefore, power connection is not a problem in most public schools.

Despite the government's efforts to address inadequate energy and technology infrastructure, other challenges persist. Digital literacy remains low among learners and teachers. In some parts of the country, such as Wajir, Mandera, Turkana, and Marsabit, internet connectivity is poor. The costs of digital devices also limit access to digital content (Munavu, 2023). Many teacher educators do not have access to digital devices that would enable them to integrate technology into the learning process. Additionally, teacher educators and trainees lack consistent access to the Internet, and when it is available, the bandwidth is often below 1 GB (MoE, 2021). In summary, low internet connectivity limits the effective use of ICT in learning; where connectivity exists, institutions tend to underutilize technology for curriculum delivery and management (Munavu, 2023).

Moreover, empirical research by Murithi & Yoo (2021) examined the availability of ICT infrastructure in public primary schools for the effective implementation of digital learning. The findings on the presence of ICT devices revealed that most schools lack internet connectivity. Additionally, about 70% of teachers reported that their schools do not have projectors, which are essential for integrating technology into education. Furthermore, teachers indicated that their schools were not adequately equipped for the introduction of digital devices, with 80% noting the absence of sockets and power extension cables in classrooms and computer labs. Moreover, 73.5% of teachers

mentioned that they did not have access to government-provided laptops. Despite these challenges, 55.8% of teachers reported that students had relatively high access to tablets.

Several challenges impede the effective integration of ICT in primary education. One major issue is the lack of adequate teacher training. Pelgrum (2001) highlights that insufficient professional development is a significant barrier, as teachers often lack the necessary skills and confidence to use ICT effectively. Additionally, the availability of resources and infrastructure is critical. Ertmer (1999) argues that without adequate access to technology and technical support, teachers cannot successfully integrate ICT into their teaching practices. Strategies to overcome these challenges include continuous professional development for teachers (Mishra & Koehler, 2006) and the alignment of school policies with national ICT strategies to facilitate implementation (Tondeur, van Braak, & Valcke, 2007).

2.5 Administrative Support Strategies for ICT Integration in Schools in the CBC Framework

The integration of Information and Communication Technology (ICT) in education aims to enhance educational outcomes by leveraging technology for lesson assessment. This literature review explores recent studies on teachers' experiences with ICT integration across various regions, including America, Europe, Asia, Africa, East Africa, and Kenya, to identify effective strategies and challenges.

In the United States, the use of ICT in assessment is prevalent, with digital tools enabling more efficient and personalised evaluations. A study by Means et al. (2020) highlighted the benefits of using online quizzes and automated grading systems, which provided immediate feedback and facilitated data-driven instruction. However, concerns about data privacy and the digital divide were noted as challenges.

European educators have adopted ICT-based assessments to enhance formative assessment practices. According to Redecker (2018), digital tools such as e-portfolios and online assessments enable teachers to monitor student progress and tailor instruction accordingly. European teachers reported positive experiences with ICT-based assessments, particularly in terms of efficiency and feedback.

In Asia, ICT-based assessments are used to support personalised learning. A study by Zhang et al. (2021) in China found that digital assessments helped teachers identify learning gaps and provide targeted support to students. However, the study also noted the need for reliable internet access and robust digital infrastructure to ensure the effectiveness of these assessments.

In Africa, ICT-based assessments are gradually being adopted, though challenges remain. Hennessy et al. (2021) found that in sub-Saharan Africa, teachers who used digital assessment tools reported improved efficiency and feedback. However, issues such as limited access to technology and unreliable internet connections hindered widespread adoption.

In East Africa, the integration of ICT in assessment practices is gaining traction. Mtebe and Raphael (2019) reported that Tanzanian teachers who used digital assessment tools found them beneficial for tracking student progress and providing timely feedback. Nonetheless, the study highlighted the need for consistent technical support and training to enhance the effectiveness of ICT-based assessments.

In Kenya, ICT-based assessments are promoted under the CBC framework. Kariuki et al. (2021) found that teachers in Nairobi County who used digital assessment tools experienced improved efficiency in grading and feedback. However, disparities in

access to technology and training across different regions remain challenges to the effective implementation of ICT-based assessments.

One of the objectives of ICT integration by the Ministry of Education is the integration of ICTs in the curriculum assessment process while maintaining credibility, security, and integrity. In this initiative, the MoE strategizes to promote the use of ICTs in assessments while taking into consideration examiners and learners with special needs and disabilities. This shall be enhanced through conducting training on needs assessment to identify skill gaps of assessors on ICT in education and training, developing the training materials as per the gaps identified, conducting training on the use of ICTs in assessments for teachers, and training national examiners on use of ICT in assessments. The MoE also strategizes to promote the archiving and repository of assessment materials in digital format, empowering learners, educators, administrators, and other stakeholders in ICT-enabled assessments.: Promote the development and use of online assessment platforms that ensure confidentiality, integrity, and availability (CIA) of data.

Navigating teachers' experiences with ICT integration during assessment reveals both opportunities and challenges across different regions. While ICT offers significant potential to enhance educational practices, effective integration requires comprehensive training, adequate resources, and ongoing support. By addressing these factors, educational institutions can empower teachers to harness the full potential of ICT, ultimately improving teaching and learning outcomes.

2.6 Research gaps

From the literature reviewed, it comes out that ICT integration in teaching and learning in public schools, especially in developing countries such as Kenya, is still at an early stage of development amid challenges such as inadequate teacher training, challenges

with ICT infrastructure, Inadequate ICT equipment and many other factors. The literature review identifies various gaps that this study embarks on filling. They are discussed as follows:

Contextual Gap- Previous studies have not extensively examined ICT integration for Junior Secondary Schools teachers, particularly in public schools. This study will provide a comprehensive understanding of how Junior Secondary Schools teachers in Nyamache Sub-County, Kisii County, perceive and implement ICT in their teaching. The qualitative data will capture in-depth experiences and challenges, while the quantitative data will reveal broader patterns and trends.

Methodological and Content Gap- Previous research predominantly used quantitative methods to study ICT preparedness in primary schools under the 8-4-4 curriculum, while the new 2-6-6-3 curriculum introduces unique experiences for Junior Secondary Schools. Combining qualitative and quantitative approaches will address this gap by capturing detailed teacher experiences and assessing ICT integration in the new curriculum. Qualitative insights will help contextualise quantitative findings, providing a richer analysis of the 2-6-6-3 curriculum setup.

Geographical Gap- There is a lack of research on ICT integration among teachers in Kisii County. Conducting a mixed-methods study will fill this geographical gap by providing both detailed qualitative insights and quantifiable data specific to Kisii County, offering a comprehensive view of ICT integration practices, especially in rural settings.

Digital Divide and Equity Gap- Limited research on strategies to overcome the digital divide and ensure equitable access to ICT resources, especially in under-resourced areas. This study will use qualitative data to explore context-specific challenges and

solutions and quantitative data to assess the availability and distribution of ICT resources, addressing equity issues in rural settings.

Link to Student Outcomes and Innovative Assessment Gap- There is inadequate research linking ICT integration to teacher assessment practices using emerging technologies. By combining qualitative and quantitative data, the study will examine how ICT impacts student learning and achievement while also exploring innovative assessment practices. This approach will provide a holistic view of ICT's role in education

2.7 Summary of the Literature Review

The literature indicates that effective ICT integration into teaching within the Competence-Based Curriculum (CBC) requires diverse instructional methods supported by appropriate competencies, pedagogical strategies, and ICT resources. Various tools, such as interactive whiteboards, educational apps (e.g., Duolingo, Kahoot!), multimedia content, and collaborative platforms, enhance learner engagement, critical thinking, creativity, and interaction. Existing research across different contexts highlights the promise of immersive technologies like VR/AR and collaborative digital tools to support 21st-century skills. However, persistent challenges include teachers' limited ICT skills, insufficient pedagogical training, and inadequate school infrastructure. Ongoing professional development, policy support, and resource allocation are vital to ensure sustained ICT integration and improve teaching and learning under the CBC.

Professional development for ICT integration in CBC teaching is guided by policy frameworks that promote professional development needs at all levels of education. Despite these policy ambitions, teachers often face significant competency and resource gaps that hinder meaningful ICT use. Many teachers feel underprepared due to limited

hands-on training during pre-service and in-service programs. Studies show that although ICT tools are available in some schools, they are often underutilized due to a lack of pedagogical support. Researchers advocate continuous professional development, regular hands-on practice, administrative backing, and tailored training to help teachers overcome these obstacles. Aligning ICT use with the CBC requires sustained support to enable educators to confidently and creatively leverage technology for more engaging and effective learning experiences.

School infrastructure plays a central role in facilitating ICT integration under the CBC framework. The Kenyan government's Digital Literacy Programme (DLP) has increased access to computers and tablets in schools, yet device shortages, limited internet connectivity, and unreliable electricity persist, especially in rural and marginalised areas. Teacher and learner access to ICT tools is often uneven, and low digital literacy among educators further limits effective use. Schools also lack adequate projectors, power extension cables, and stable internet connections, making it difficult for teachers to integrate ICT into lessons. Strengthening ICT integration in schools requires investments in affordable internet access, technical support, training, and policies that enhance resource equity and address existing infrastructural gaps.

Administrative support strategies are vital for effective ICT integration into CBC schools. Research across global contexts, including America, Europe, Asia, Africa, East Africa, and Kenya, demonstrates that ICT-based assessments and teaching tools improve efficiency, feedback, and personalized learning. However, uneven access to ICT, inadequate training, and data privacy concerns pose significant challenges. The Ministry of Education is addressing these by facilitating ICT skill-building for teachers and examiners, providing appropriate digital tools and materials, and ensuring robust data security measures. Sustained administrative leadership, continuous professional

development needs, and supportive policies are essential to fully realise the benefits of ICT in teaching, learning, and assessment under the CBC.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

This section presents the research design and methodology. It describes the research design, research paradigm, target population, sample design, data collection methods, validity and reliability of instruments, data analysis procedures, and ethical considerations.

3.1 Research Design and Approach

Research design refers to the framework, outline, or strategy guiding the research process to address the specific problem under investigation (Kothari, 2013). This study adopted an explanatory sequential design, a mixed methods approach in which quantitative data are collected and analysed first, followed by qualitative data collection and analysis. The design allowed the researcher to use the qualitative phase to explain, elaborate, and provide deeper insights into the initial quantitative results (Creswell, 2014). In the first phase, quantitative data was gathered through questionnaires administered to junior school teachers to measure their integration of Information and Communication Technology (ICT) in the teaching of English. In the second phase, qualitative data was collected through interviews with heads of institutions to help clarify and expand on the quantitative findings. This sequential approach enabled the researcher to build a more comprehensive understanding of ICT integration by connecting statistical trends with in-depth contextual explanations.

3.2 Research Paradigm

A research paradigm represents a perspective embraced by researchers, shaped by a set of shared assumptions, concepts, practices, and values. A research paradigm guides the direction of a study and influences how researchers perceive and interpret reality

(Kaushik & Walsh, 2019). This study adopted a pragmatic paradigm, rooted in the philosophies of Charles Sanders Peirce, William James, and John Dewey. Pragmatism emphasises the practical implications and applications of ideas, advocating for the use of multiple methods to effectively address research questions and solve real-world problems. Central to pragmatism is the integration of diverse methods to achieve a comprehensive understanding, prioritising practical outcomes.

In this study, pragmatism underpins the combined use of qualitative and quantitative approaches to investigate and assess Junior Secondary Schools teachers' perspectives on ICT integration in the Competence-Based Curriculum. This approach allows for methodological flexibility, enabling the study to explore various aspects of the research problem and gather a broad range of insights into ICT teaching and learning (Morgan, 2007; Creswell, 2009).

The pragmatic paradigm guide used quantitative methods to collect data, providing factual evidence about teachers' perspectives on ICT integration in instruction at Rural Public Junior Secondary Schools in Nyamache Sub-County. This approach facilitated a straightforward descriptive analysis. The qualitative component enabled in-depth data collection on these perspectives, allowing for a rich narrative analysis. Pragmatism encourages the use of multiple methods based on practicality and desired outcomes rather than strict adherence to a single methodology, fostering a holistic understanding of the research issue.

According to Morgan (2007), pragmatism shifts the focus from the debate over qualitative versus quantitative methods to the research question itself, advocating for the use of methods best suited to achieving the research goals. This is particularly beneficial in complex educational research where diverse perspectives and data sources are essential to fully understand the intricacies of teaching and learning processes

(Morgan, 2007). Pragmatism also underscores the importance of context and the specific needs of the research when selecting methods, rather than being bound by a particular methodological allegiance (Parviaz & Mufti, 2016). Mwaura (2012) highlights that pragmatism enables researchers to draw from a variety of techniques and perspectives, allowing for the development of practical solutions to real-world challenges. Consequently, pragmatism as a mixed-methods paradigm offers a balanced and adaptable framework well-suited to addressing the complexities inherent in educational research.

3.3 Study Location

Nyamache subcounty is in Bobasi constituency, located in Kisii County, Kenya. The sub-county has a land size of 162.7 km² per square area. According to the 2019 Kenya National Bureau of Statistics, the subcounty population stands at 130,898 persons. The population density stood at 804.5/km². In 2009, the sub-county had 68,782 females and 62,113 males, representing 52.5% and 47.5%, respectively. The age group distribution in the sub-county was as follows: 0-14 years, there were 54,288 persons; 15-64 years, there were 69,769 persons; and 65+ years, there were only 6,838 persons. with 65+ years, meaning that the majority were in the age brackets of 15-64 years. The subcounty had a total of 62 rural Public Junior Secondary Schools hosted in former primary schools under one umbrella referred to as a Comprehensive school. There was a total of 252 Junior Secondary Schools teachers in public schools who handled various learning areas within the sub-county.

The study focused on rural junior secondary schools, as this type of school has been identified as facing many challenges compared to urban schools. A survey by Gichuru (2024) done in rural public junior secondary schools in Nyeri County acknowledges the notable disparities between urban and rural schools in Kenya. Rural schools have been

observed to receive less attention, fewer resources, and fewer pilot programs compared to urban schools, which underscores the persistent inequalities that pose significant challenges to the effective implementation of the Competency-Based Curriculum (CBC).

3.4 Target Population

The target population refers to the complete group of individuals or elements that the research focuses on, as defined by Kothari (2014). This ensures that the population is relevant to the research objectives. According to Cooper and Schindler (2011), the target population is the larger group to which the study aims to generalise its findings.

The target population for this study included all 62 rural public Junior Secondary Schools in Nyamache Sub-County, comprising 62 Heads of Institutions and 252 Junior Secondary Schools teachers. These schools were selected because they are government-run and central to the implementation of ICT integration in the Competency-Based Curriculum (CBC). Teachers served as the primary respondents, offering insights into teaching practices, digital competencies, resource availability, and ICT use in assessments. Heads of Institutions were included as secondary respondents to provide administrative perspectives on ICT integration.

The target population was justified because it represented the full teaching staff involved in curriculum delivery. The Junior Secondary Schools teachers provided insights into classroom-level ICT practices, while the Heads of Institutions offered critical perspectives on administrative support, policy implementation, and resource management for ICT integration. Including the entire population ensured that all eligible participants had an equal opportunity to be represented in the study.

3.5 Sampling Frame

A sampling frame is a comprehensive list or other systematic method used to define the population from which a sample is drawn (Cooper & Schindler, 2011; Kombo & Tromp, 2014). It specifies the set of elements from which a sample can be selected. For this study, the sampling frame included 62 Junior Secondary Schools in Nyamache Sub-County, comprising 252 teachers and 62 Heads of Institutions, who were involved in teaching and administration, respectively. Table 3.1 provides a detailed representation of the distribution of respondents for the study, ensuring that both qualitative and quantitative samples were drawn from a clearly defined population.

Table 3. 1 Sampling Frame

Target		Total population	Sample size	Sampling technique
Junior	Secondary	252	70	Simple random sampling
Schools Teachers				
Heads of Institutions		62	19	Purposive sampling
Total		314	89	

Source: (Author,2025)

The sample design in this study involved selecting a representative sample from the target population of 314 individuals, comprising 252 Junior Secondary Schools teachers and 62 Heads of Institutions across 62 rural public Junior Secondary Schools in Nyamache Sub-County.

A total of 19 schools, approximately 30% of the total, were purposively selected to ensure equitable representation across all six wards (Kothari,1999). All 19 Heads of Institutions from the selected schools were purposively sampled. In addition, 70 Junior Secondary Schools teachers were selected using simple random sampling across the six

wards in the sub-county. This approach ensured both geographic and institutional representation while integrating qualitative and quantitative research elements.

3.5.1 Sampling procedure

A sample size refers to a representative subset of a population from which generalisations are made about the entire population targeted in a study (Creswell & Plano Clark, 2011). In this study, sampling was conducted in two sequential phases, aligned with the explanatory sequential design. The first phase involved quantitative data collection through probability sampling, followed by a qualitative phase where participants were purposively selected based on the quantitative results.

In the quantitative phase, simple random sampling was used to select seventy Junior Secondary School teachers from nineteen purposively chosen rural public Junior Secondary Schools in Nyamache Sub-County. These schools were selected to ensure representation from all six wards, constituting approximately 30% of the total sixty-two schools in the sub-county, a proportion considered adequate for educational research (Mugenda & Mugenda, 2012). Simple random sampling ensured that each teacher had an equal chance of selection, thus reducing bias and increasing representativeness.

In the second, qualitative phase, purposive sampling was used to select Heads of Institutions from the same nineteen schools. These participants were chosen for their ability to provide in-depth insights into ICT integration, policy implementation, and resource management. The purposive selection was informed by findings from the quantitative phase to allow deeper exploration of emerging issues.

3.6 Data Collection Methods

This study employed a mixed methods approach using an explanatory sequential design, where quantitative data was collected and analysed first, followed by qualitative

data to explain and expand on the initial findings. Data collection instruments included structured questionnaires (Appendix V) administered to junior secondary school teachers for Grades 7, 8, and 9, and semi-structured interviews (Appendix VI) conducted with Heads of Institutions.

3.6.1 Structured Questionnaires

According to Kombo and Tromp (2006), a questionnaire is a self-report instrument that presents a consistent set of questions to many respondents, providing an efficient means of gathering comparable data. Responses may be either closed-ended, allowing predefined options, or open-ended, allowing respondents to elaborate freely. Questionnaires are valued for their ability to minimise researcher bias and standardise the data collection process (Kothari, 2008).

In this study, structured questionnaires were used in the first phase to collect quantitative data on teaching methods used, competencies required, availability of ICT infrastructure, and ICT integration during assessment. The items were developed around the study variables and were measured using a 5-point Likert scale: Strongly Disagree, Disagree, Neutral, Agree, and Strongly Agree. The results from the questionnaires provided an overview of trends and patterns in ICT integration practices among teachers, forming the basis for follow-up qualitative inquiries.

3.6.2 Semi-Structured Interview Schedules

In the second phase, semi-structured interviews were conducted to help explain and expand on the quantitative findings. An interview schedule is a guided, face-to-face or virtual interaction in which the interviewer uses open-ended questions to collect in-depth responses. These conversations are recorded, transcribed, and stored for thematic

analysis (Creswell, 2012). Interviews are particularly valuable in clarifying ambiguous responses from questionnaires and exploring complex issues in greater detail.

The interviews targeted Heads of Institutions, focusing on their perspectives on ICT integration, infrastructure, administrative support, and the competencies required for effective technology use in teaching. This phase allowed the researcher to probe further into areas where the questionnaire results revealed gaps, inconsistencies, or unexpected trends. As Creswell (2014) notes, interviews provide the flexibility to adapt questions during the conversation, enabling richer, more contextually grounded data.

3.7 Validity of the Research Instruments

The precision of research instruments is a key determinant of their viability. According to Mugenda and Mugenda (2003), validity refers to the extent to which an instrument accurately measures what it is intended to represent about the objectives being investigated. In this study, both questionnaires and interview schedules underwent rigorous validity checks to ensure they were aligned with the research objectives.

For the questionnaires, content validity was employed to determine the extent to which the data obtained correctly represented the study objectives. The supervisors and the researcher also evaluated the construct validity of the questionnaires and made necessary modifications. This process involved a detailed expert consultation with colleagues and supervisors, leading to targeted modifications and redesigns of items that were ambiguous, redundant, or insufficiently aligned with the constructs under investigation.

Similarly, the interview schedules underwent content validity checks to ensure that the questions were comprehensive, clear, and relevant to the study objectives. Expert reviewers, including the supervisors and experienced colleagues in the field of

education research, assessed the interview questions for appropriateness, logical flow, and coverage of the intended themes. Their feedback informed refinements to question wording, sequencing, and probing strategies to ensure that the interview schedules would elicit rich, accurate, and relevant qualitative data.

3.8 Reliability of the Research Instruments

Reliability refers to the degree to which an instrument yields consistent results after repeated trials (Creswell & Creswell, 2018).

For the questionnaires, piloting was conducted with seventy (70) Junior Secondary School teachers to assess clarity, relevance, and applicability to the school context. Feedback from the piloting process was used to revise ambiguous or redundant items (Mahalakshmi et al., 2023). After refinement, the questionnaires were administered to respondents in the main study, completed, and returned. Reliability was then tested using Cronbach's alpha, where a coefficient of 0.762 was obtained, indicating a strong level of internal consistency (Tavakol & Dennick, 2011).

For the interview schedules, nineteen (19) Heads of Institutions were purposively selected to participate in the piloting phase. Participants were chosen based on relevant characteristics such as professional training, teaching experience, and familiarity with the Competency-Based Curriculum (CBC) and ICT integration practices. All interviews followed the same guide to maintain uniformity, and consistent phrasing and sequencing of questions was ensured. Feedback from the piloting stage was used to refine the questions and remove ambiguity. Member checking was also applied, allowing participants to verify the accuracy of the interpretations of their responses, thus enhancing dependability (Lincoln & Guba, 1985).

As Cohen et al. (2018) emphasise, piloting is a critical process for confirming clarity, relevance, and feasibility before large-scale administration in the research setting.

3.9 Administration of Instruments

Data collection procedures entail the systematic use of research instruments to obtain and measure information relevant to the research questions (Karunaratna et al., 2024). In this study, questionnaires were administered to participants first and retrieved immediately upon completion, following assurances of confidentiality and the importance of honest responses. This initial quantitative phase aimed to gather broad, generalizable data on ICT integration practices.

Thereafter, semi-structured face-to-face interviews were conducted with the heads of institutions in their offices, providing a natural and comfortable setting for open information exchange (Cohen et al., 2018). These qualitative interviews were conducted after the questionnaire phase to further explore and explain the patterns emerging from the quantitative results, consistent with the sequential explanatory research design. This approach allowed for a deeper understanding of the contextual factors and experiences influencing ICT integration in the study area.

3.10 Data Analysis Procedures

Data analysis is evaluating data using analytical and logical reasoning to examine each component of the data provided, which helps inspect, clean, transform, and model data to discover useful information and suggest conclusions (Bryman & Bell, 2007). In this explanatory sequential design, quantitative data was analysed first, and the results informed the subsequent qualitative phase.

For the quantitative phase, descriptive statistics, including means, standard deviations, frequencies, and percentages, were computed to summarise and interpret the

demographic characteristics and ICT usage patterns among Junior Secondary School teachers (Creswell & Creswell, 2018; Pallant, 2020). Data was analysed using SPSS version 25, which is widely recognised for its accuracy and efficiency in managing large datasets.

The qualitative phase was followed to provide deeper insights and explanations for the quantitative results. Interviews with Heads of Institutions were transcribed immersively and coded with significant statements related to administrators' experiences of ICT integration. Thematic analysis was employed to identify and interpret key patterns in these experiences (Braun & Clarke, 2021). The qualitative data was coded and categorised using MAXQDA software, enabling efficient organisation, retrieval, and interpretation of recurring themes.

Finally, integration of findings occurred at the interpretation stage, where qualitative themes were used to explain, expand upon, and contextualise the quantitative results. The researcher engaged in bracketing, intentionally setting aside preconceived notions and biases about teaching and ICT integration, to maintain objectivity throughout the analysis process (Grajzel, 2025; McLeod, 2024).

3.11 Ethical Issues in Research

Ethical rigour is foundational to ensuring the reliability and generalizability of research findings (Shitlon 2021). Ethical issues fall into three categories: those related to the research, the researcher, and the research process. In this study, ethical clearance was secured from Moi University's Ethics Committee and from the National Commission for Science, Technology and Innovation (NACOSTI), with documentation included as Appendix II and Appendix III, respectively. These approvals align with national

requirements that mandate Institutional Ethics Review Committee (IERC) endorsement for human-participant research before NACOSTI permits are granted (NSEC, 2021).

Permission letters were also submitted to the Education Sub-County Office in Nyamache and to Heads of Institutions, as shown in Appendix VII. Participants were assured of anonymity and confidentiality; personal identifiers were not collected in the data-gathering tools. Informed consent, obtained and documented as Appendix IV, was sought from all participants before data collection commenced. Echoing best practices in Kenyan research, participants were given copies of their transcripts or questionnaire responses for verification, promoting credibility and participant ownership of data (Were et al., 2023).

The researcher declared any potential biases to participants and endeavoured to minimise these, enhancing reflexivity and trustworthiness. Participants received a debrief explaining both the purpose of the study and its findings, and any questions they had were addressed, reflecting recommendations for transparency and participant care in East African research contexts (WERK, 2020). Finally, collected data, especially any sensitive information, were securely encrypted and stored, in keeping with Kenya's legal requirements regarding data protection and confidentiality.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS, INTERPRETATION, AND DISCUSSION

4.0 Introduction

This chapter presents the data presentation, analysis, interpretation, and discussion of findings from both quantitative and qualitative data. It begins with the presentation of descriptive statistics derived from questionnaires administered to Junior Secondary Schools teachers, analysed using SPSS version 25. This is followed by thematic analysis of qualitative data from interviews with Heads of Institutions, which were audio-recorded, transcribed, and coded using MAXQDA software. Themes were generated based on the codes and code segments identified by the researcher.

The purpose of this study was to examine the integration of ICT in teaching within the Competency-Based Curriculum (CBC) framework in rural public Junior Secondary Schools in Nyamache Sub-County, Kisii, Kenya. The first three quantitative objectives focused on examining instructional methods used by teachers, identifying gaps in teacher competencies, and assessing the availability of ICT infrastructure and resources. The fourth, qualitative objective explored the experiences of school administrators in supporting ICT integration. The findings provide insights into both the challenges and opportunities in implementing digital learning in rural school settings.

The presentation and analysis of both quantitative and qualitative data are done separately and interpreted and discussed in conjunction to find meaning, deeper understanding, and connections between the two data sets (Creswell & Clarke, 2018). Verbatims from the code segments are presented to support the main themes.

This section presents the quantitative data analysis, which was conducted using statistical methods to summarize and interpret the findings. The data is displayed in the

form of tables, charts, means, percentages, and standard deviations to provide a clear and comprehensive understanding of the trends and patterns observed in the study. These statistical measures help illustrate the extent of ICT integration in teaching within the CBC framework and highlight key insights drawn from the collected data.

In addition to the quantitative analysis, this chapter also presents the qualitative findings, which were derived from interview responses. MAXQDA was used to conduct coding, from which code segments were generated and key themes identified. Each major theme was further broken down into sub-themes to provide a nuanced understanding of teacher experiences regarding ICT integration. The analysis is supported with direct participant verbatims and discussed with existing literature and the study objectives to ensure contextual relevance and depth. The demographic information of respondents is given first, followed by the data presentation, Interpretation, analysis and discussion, which is tied to the objectives.

4.1 Demographic information of participants

4.1.1 Response Rate

The study sought to fetch data from approximately 76 respondents, which led to the issuance of an exact number of questionnaires. Even though the data was successfully collected from 70 respondents who could fill in the questionnaires and return them. This calculates to 92.11% as the questionnaire response rate falls within the brackets of a large sample size, $n \geq 30$. A response rate of 50% is sufficient for analysis and reporting, 60% is good, and 70% and above is excellent; hence, this response rate is excellent for analysis.

4.1.2 Demographic data from Junior Secondary Schools teachers

This section presents the demographic characteristics of the study participants, beginning with Junior Secondary Schools teachers who participated in the study and

then the Junior Secondary Schools Heads of Institutions. The data from Junior Secondary Schools teachers highlights key variables including age, gender, teaching experience, and academic qualifications. These attributes were essential in understanding the background of the respondents and in interpreting their insights with ICT integration in the teaching and learning process within the CBC framework. The demographic profile provides context to the findings and helps to establish patterns and relationships between teacher characteristics and their engagement with ICT in instructional practices.

Table 4. 1 Demographic profiles of Junior Secondary Schools teachers

Variable	Category	Frequency (N)	Percentage (%)
Age	Under 25 years	2	2.9
	25-34 years	55	78.6
	35-44 years	10	14.3
	45-54 years	3	4.3
Gender	Male	43	61.4
	Female	27	38.6
Teaching Experience	Less than 1 year	11	15.7
	1 year	7	10.0
	2 years	43	61.4
	3 years	9	12.9
Academic Qualification	Masters	1	1.4
	Degree	67	95.7
	Diploma	2	2.9

Source: Research data (2025)

The study examined the demographic characteristics of Junior Secondary Schools teachers in Nyamache Sub-County to understand their background and how it may influence ICT integration in teaching. The key aspects analysed include age, gender, teaching experience, and academic qualifications.

Table 4.1 shows the analysis of demographic information of participants. The study obtained the ages of Junior Secondary Schools teachers, and the findings indicated that most Junior Secondary Schools teachers, 55 (78.6%), were aged between 25 and 34 years, followed by those aged 35 to 44 years, comprising 10 (14.3%) of the respondents. A small proportion of teachers, 2 (2.9%), were below 25 years old, while 3 (4.3%) were between 45 and 54 years old. The dominance of young teachers aligns with Kenya's recent implementation of the Competency-Based Curriculum (CBC), which led to new staffing requirements (Ministry of Education, 2023). Younger teachers are generally more receptive to ICT integration as they are more likely to have been exposed to digital learning tools during their training (Tondeur et al., 2017). However, the presence of older teachers may present challenges, as research suggests that teachers above 40 years often exhibit lower confidence in using ICT tools compared to their younger counterparts (Koehler & Mishra, 2009).

In terms of gender distribution, the study found that 43 (61.4%) of Junior Secondary Schools teachers were male, while 27 (38.6%) were female. This distribution reflects a gender imbalance, which may influence ICT adoption, as studies indicate that male teachers tend to engage more with technology-based instructional methods than female teachers (Akinola, 2020). However, gender differences in ICT use are diminishing due to increased access to professional development and training (UNESCO, 2021). Ensuring equitable ICT training opportunities for both male and female teachers is crucial in promoting effective integration across all classrooms.

Regarding teaching experience, 43 (61.4%) had two years of experience, aligning with the introduction of Junior Secondary Schools in 2023. Teachers with three years of experience constituted 9 (12.9%), while those with less than one year accounted for 11 (15.7%). Only 7 (10.0%) of teachers had one year of experience. The high proportion

of teachers with two or fewer years of experience suggests that many educators are still adapting to both CBC and ICT integration. Research shows that teachers with limited experience often struggle with ICT adoption due to a lack of familiarity and confidence in digital teaching tools (Buabeng-Andoh, 2012). This highlights the need for targeted capacity-building initiatives to support early-career teachers in leveraging ICT for instruction.

The academic qualification levels indicated that most teachers, 67 (95.7%), held a degree, while 2 (2.9%) possessed a diploma, and only 1 (1.4%) had a master's degree. The high proportion of degree holders aligns with Kenya's teacher qualification standards, which emphasize the need for competency in contemporary teaching methodologies, including ICT integration (Teachers Service Commission, 2022).

However, the limited number of teachers with postgraduate qualifications may impact advanced ICT pedagogical innovations, as studies suggest that higher academic qualifications are often linked to better ICT pedagogical knowledge (Gil-Flores et al., 2017). To enhance ICT integration, continuous professional development programs should be prioritised to equip teachers with advanced digital literacy skills.

Demographic profile of Junior Secondary Schools teachers in Nyamache Sub-County suggests that ICT integration in teaching is influenced by factors such as age, gender, teaching experience, and academic qualifications. While the predominance of young teachers presents an opportunity for digital adoption, gaps in experience and qualifications highlight the need for targeted ICT training. These findings align with global research emphasising that successful ICT integration requires not only technological infrastructure but also skilled and motivated teachers (Voogt & Knezek, 2018). Addressing these gaps through policy and professional development programs will be essential in enhancing ICT-driven teaching under the CBC framework.

4.1.3 Demographic data from Junior Secondary Schools Heads of Institutions

Lastly, demographic data from Heads of Institutions was considered crucial to the study, and it is presented as follows: Face-to-face interviews were scheduled for 12 Junior Secondary Schools administrators, one Junior Secondary Schools principal from each of the selected schools in the six wards of Nyamache subcounty. However, only 10 were interviewed due to data saturation, leading to the consumption of data from the 10 Junior Secondary Schools Heads of Institutions.

Regarding the number of learners, the schools had varied enrollments. For instance, JSSA indicated an enrolment of 213 students across Grades 7 to 9 (52, 78, and 83, respectively), while JSSB reported 94 learners, and JSSD reported approximately 122. JSSI and JSSE both reported 240 students, suggesting relatively higher enrolment. On the other hand, JSSG reported approximately 100 learners, and JSSH mentioned 112 students. JSSC, however, described their institution as serving both primary and Junior Secondary Schools learners, with a total population of about 480, making it an outlier in terms of size. These variations in enrolment reflected the diversity in school sizes within rural Nyamache Sub-County. According to Barasa and Mwangangi (2022), school size influences resource distribution and teacher workload, which in turn affect the level and quality of ICT integration in instruction.

Teacher distribution also varied across the institutions. Some schools, such as JSSA and JSSD, reported having six teachers, while others, like JSSB and JSSH, had four. JSSJ elaborated on their staffing model, reporting five permanently recruited teachers, one Board of Management (BOM) teacher, and one intern. JSSF provided an insightful breakdown, stating they had six teachers, all trained and qualified, with five being on permanent terms and one on an internship program. These variations pointed to staffing inconsistencies common in rural public schools, which are also echoed in research by

Makori and Onderi (2014), who argued that insufficient and inconsistent teacher deployment undermines sustained technology use in classroom practices.

For confidentiality and anonymity, the researcher used codes to refer to individual respondents. Participants were identified with the code JSS, and letters A-J were used in addition to specify the first respondent to the last respondent, respectively, to have the format JSSA..JSSD..JSSJ. The findings were, therefore, presented using the designated codes and letters. For instance, JSSA: Participant One (1).

The analysis of school demographic data revealed that the schools involved in the study were all located in rural settings, as confirmed by all ten interviewed administrators (JSSA–JSSJ). The rural context, as emphasised by participants such as JSSE and JSSH, shaped the operational challenges and opportunities for ICT integration in teaching. Creswell (2023) recommended that contextual descriptions provide foundational understanding for interpreting participant narratives, and this rural backdrop was crucial in anchoring the experiences shared. Studies such as Waweru and Barasa (2020) emphasised that rural schools in Kenya often face infrastructural constraints, which significantly impact ICT adoption and teacher capacity.

Moreover, interview data revealed that staffing patterns varied not only in numbers but also in structure, with some teachers employed on temporary contracts while others held permanent positions. This structural diversity influenced ICT integration efforts, as permanent teachers were more likely to access continuous training and professional development opportunities (Njuguna & Kamau, 2021). Such differences in staffing stability may explain the variation in confidence and consistency with which ICT was integrated into teaching across the schools.

As Creswell (2023) emphasised, qualitative research requires the researcher to situate participants within their environments, capturing the nuance of their experiences. By framing the schools' rural contexts, learner populations, and staffing patterns, this analysis laid a foundational understanding necessary to interpret the administrators' subsequent narratives about ICT integration challenges and successes. The school demographics indicated systemic inequalities in staffing and enrolment that could significantly shape ICT resource distribution, teacher preparedness, and student access to digital tools in instruction.

4.2 Data Presentation and Analysis

This section presents the analysis of both quantitative and qualitative data sets in line with the explanatory sequential design. Quantitative data from the questionnaires is presented and analyzed first to identify trends and patterns related to the study objectives. This is followed by qualitative data from interviews, which is thematically analysed to explain and elaborate on the quantitative findings. The objectives addressed in this chapter include instructional methods employed by teachers, existing ICT infrastructure, teacher capacity-building needs and competencies, and the experiences of school administrators with ICT integration in the teaching and learning process.

4.3 Instructional Methods Employed by Teachers for ICT Integration

The first objective sought to determine the specific pedagogical strategies that teachers in rural public Junior Secondary Schools in Nyamache Sub-County, Kisii County, utilized when incorporating ICT tools into their classroom instruction. This section presents the findings related to the instructional methods employed by teachers for ICT integration in teaching, as reported in the teacher questionnaire. Table 4.2 demonstrates teachers' various instructional methods in integrating ICT into their teaching.

Table 4.2 Instructional Methods for ICT Integration

Instructional Method	Never (%)	Rarely (%)	Sometimes (%)	Often (%)	Always (%)
Blended Learning	14.3	12.9	48.6	17.1	7.1
Flipped Classroom	32.9	41.4	22.9	2.9	-
Gamification	48.6	31.4	17.1	2.9	-
Collaborative Learning	41.4	40.0	17.1	1.4	-
Simulation-Based Learning	27.1	42.9	28.6	1.4	-

Source: Research data (2025)

4.3.1 Blended Learning

The findings indicated that blended learning was a commonly employed method of ICT integration, with 43 (48.6%) of teachers reporting they sometimes used it, 15 (17.1%) using it often, and 6 (7.1%) always employing it. Only 13 (14.3%) reported never using this method. These results are consistent with those of Oluoch (2019) and Kinyanjui (2018), who noted that blended learning, which combines traditional face-to-face instruction with digital resources, enhances student engagement and accessibility in digital literacy programs. The moderate adoption observed in this study suggests that, while teachers acknowledge its benefits, infrastructural and technical challenges may impede its consistent application.

4.3.2 Flipped Classroom

The flipped classroom, an instructional model that reverses traditional teaching by delivering content outside class, typically through videos or reading materials, and using class time for interactive, student-centred activities, was less frequently utilised. A total of 29 (32.9%) teachers reported never using it, while 37 (41.4%) rarely implemented it. Only 3 (2.9%) reported using it often. This finding contrasts with Pozas and Letzel (2021), who found that pre-service teachers in Turkey were highly motivated to use digital technologies, including those employed in flipped classrooms. The low

uptake in the current study may be attributed to limited digital content creation skills among teachers and restricted access to ICT resources outside the classroom.

4.3.3 Gamification

Similarly, the data showed that gamification was one of the least utilised instructional methods, with 43 (48.6%) of teachers never using it and 28 (31.4%) rarely incorporating it. Only 3 (2.9%) reported using it often, while 15 (17.1%) used it sometimes. This stands in contrast to Jemutai and Kafwa (2023), who emphasised the effectiveness of the play-way method in enhancing digital literacy competencies among primary school pupils. The disparity suggests that while gamification holds potential for ICT integration, teachers may lack adequate training or resources to implement it effectively in classroom settings.

4.3.4 Collaborative learning

The study found that collaborative learning was also underutilised, with 37 (41.4%) of teachers never using it and 36 (40%) rarely implementing it. Only 1 (1.4%) of teachers used it often, while 15 (17.1%) reported using it sometimes. This contradicts Kerkhoff and Makubuya (2021), who reported that collaborative learning, including digital storytelling, promotes creativity and critical thinking. The limited use in the present study suggests challenges such as a lack of ICT infrastructure or teachers' preference for more conventional instructional approaches.

4.3.5 Simulation-based learning

Simulation-based learning was also rarely used, with 24 (27.1%) of teachers never using it and 38 (42.9%) rarely incorporating it into their teaching. Only 1 (1.4%) of teachers reported using it often, while 25 (28.6%) indicated they used it sometimes. This aligns with Asava (2021), who found that teachers infrequently used simulations in CBC implementation and recommended training to enhance its adoption. The low

usage in the current study may be due to limited access to simulation software and inadequate teacher training on its implementation.

The findings indicate that most teachers in the study rely on traditional instructional methods rather than leveraging ICT-enhanced techniques such as gamification, flipped classrooms, and simulation-based learning. This aligns with the broader trend of limited ICT utilization in Kenyan education due to infrastructure, training, and resource constraints. For instance, Shikomera et al. (2023) observed that limited internet connectivity significantly hinders ICT integration by teachers in public primary schools in Kenya. Similarly, Phulpoto et al. (2024) reported that over half of teachers lacked basic technological skills, and even among those trained, many felt inadequately prepared to integrate ICT effectively. These recent findings support the current study's observation of low adoption of interactive methods in teaching.

Moreover, the findings suggest that while blended learning is relatively more accepted, other interactive methods, such as gamification and collaborative learning, remain underutilised. This resonates with Hassan (2024), who argued that successful ICT integration requires flexible pedagogical strategies that merge traditional and digital teaching approaches. Similarly, Phulpoto et al. (2024) found that only 41% of teachers employed ICT-enhanced strategies beyond blended learning, with gamification and flipped classrooms being the least implemented due to limited exposure and insufficient training.

The analysis further revealed that ICT integration in Competency-Based Curriculum (CBC) implementation is still at an early stage, with limited adoption of innovative instructional methods. While blended learning had gained some traction, strategies such as gamification, flipped classrooms, and simulation-based learning faced significant barriers, including inadequate infrastructure and a lack of policy direction. These

findings reinforce the need for targeted teacher training, investment in ICT infrastructure, and supportive institutional policies to enhance integration. Shikomera et al. (2023) echoed similar concerns, emphasising that without reliable internet connectivity and school-level support, teachers struggle to move beyond basic technology use in the classroom.

4.4 Gaps in Teacher Competency with ICT Integration

The second objective focused on finding out the existing gaps in ICT competency among Junior Secondary Schools teachers. It widened its scope to touch on various competency areas such as confidence in ICT integration, frequency of ICT use, technical skills, pedagogical knowledge, designing digital content and assessment strategies. Table 4.4 shows the means and standard deviations on gaps in teacher competency with ICT integration.

Table 4. 3 Teacher Competency Gaps

Competency Area	Mean	Standard Deviation
Confidence in ICT Integration	3.94	1.048
Frequency of ICT Use	2.89	1.001
Technical Skills	3.73	0.883
Pedagogical Knowledge	3.86	0.905
Designing Digital Content	3.53	0.829
Assessment Strategies	3.71	0.887

Source: Researcher (2025)

4.4.1 Confidence in ICT Integration

Confidence in ICT integration was notably high among the teachers ($M = 3.94$, $SD = 1.048$), suggesting that educators generally felt self-assured when utilizing ICT tools in their instructional practices. This aligns with assertions by Tondeur et al. (2017), who argue that teacher confidence significantly influences the successful integration of technology in classroom instruction. However, despite high confidence levels,

confidence alone does not guarantee effective pedagogical application without continuous training and support.

4.4.2 Frequency of ICT Use

The frequency of ICT use was relatively low ($M = 2.89$, $SD = 1.001$), indicating that while teachers may feel confident, they do not frequently employ ICT in their teaching routines. This gap between confidence and actual use supports previous findings by Buabeng-Andoh (2012), which emphasised infrastructural limitations, lack of access, and institutional support as barriers to frequent ICT usage in many developing contexts.

4.4.3 Technical Skills

In terms of technical skills, teachers reported a moderately high mean score ($M = 3.73$, $SD = 0.883$), suggesting a reasonably good grasp of handling ICT tools. Nonetheless, technical know-how alone may not translate to effective classroom practice unless coupled with pedagogical insight, a point emphasised by Mishra and Koehler's (2006) TPACK framework, which advocates for an integrated approach to technological, pedagogical, and content knowledge.

4.4.4 Pedagogical Knowledge

Pedagogical knowledge regarding ICT was relatively strong ($M = 3.86$, $SD = 0.905$), yet prior research suggests that many teachers use ICT more for lesson planning and administrative tasks rather than interactive learning (Kerkhoff & Makubuya, 2021). This echoes findings by Njagi (2020), who highlighted the necessity for continued professional development to improve the practical implementation of digital pedagogy.

4.4.5 Designing Digital Content

Teachers' ability in designing digital content showed a moderate level of competency ($M = 3.53$, $SD = 0.829$), implying that while there is some capacity for developing

educational digital materials, there remains room for growth. According to Redecker (2017), content creation is a core component of digital competence, and efforts should be made to strengthen teachers' creative abilities in digital content design to enhance learner engagement and curriculum alignment.

4.4.6 Assessment Strategies

The competency related to assessment strategies using ICT was also moderate ($M = 3.71$, $SD = 0.887$). This suggests that while teachers recognise the potential of ICT in supporting assessment, the implementation of such strategies may still be limited. As noted by Voogt and Roblin (2012), ICT-based assessments require not only digital skills but also a rethinking of pedagogical practices to ensure that assessments are meaningful, diverse, and supportive of 21st-century skills.

Despite policy frameworks advocating ICT integration (MoE, 2021), studies indicate persistent gaps in teacher competencies. Research by Koskei and Chepchumba (2020) highlighted the need for continuous in-service training to enhance digital literacy among teachers. Additionally, Heinrich et al. (2020) observed that without sufficient training, ICT integration could unintentionally exclude struggling learners, reinforcing existing inequalities.

Overall, while teachers expressed confidence in ICT integration, the practical application remained inconsistent. Aligning with Masika (2019), who found digital literacy levels among educators to be below average, the results underscore the need for sustained professional development and infrastructure support to bridge competency gaps in CBC implementation.

4.5 Assessment of Existing School Infrastructure and Resources for Effective ICT Integration in the CBC Framework

The third research objective sought to assess the adequacy of ICT infrastructure and resources in junior secondary schools to determine how well they support the integration of ICT in the Competency-Based Curriculum (CBC). The variables explored included the general adequacy of ICT resources, availability of tablets, internet access, and the presence of interactive whiteboards. Table 4.3 presents the three dimensions for existing school infrastructure and resources for effective ICT integration in the CBC framework.

Table 4. 4 Assessment of school infrastructure

Resource	Not Available (%)	Limited (%)	Adequate (%)
ICT Resources Adequacy	18.6	42.9	28.6
Tablets	18.6	71.4	10.0
Internet Access	44.3	40.0	15.7
Interactive Whiteboards	70.0	24.3	5.7

Source: Research Survey (2025)

The study assessed the adequacy of ICT infrastructure and resources in junior secondary schools to determine how well they support the integration of ICT in the Competency-Based Curriculum (CBC). The variables explored included the general adequacy of ICT resources, availability of tablets, internet access, and the presence of interactive whiteboards.

4.5.1 Adequacy of ICT resources

On the overall adequacy of ICT resources, 14 (28.6%) of respondents considered them adequate, while 21 (42.9%) noted they were limited, and 9 (18.6%) reported they were

not available at all. This indicates that most schools are operating with insufficient digital infrastructure to fully integrate ICT in their teaching and learning processes.

These findings align with the Ministry of ICT (2021), which acknowledges that despite the government's efforts through the Digital Literacy Programme, ICT infrastructure, such as computers, projectors, and tablets, remains largely inadequate. Similarly, Murithi and Yoo (2021) observed that most schools lacked the basic facilities required for digital learning, with many classrooms still unequipped with sockets and extension cables, which reflects a broader issue of infrastructural unpreparedness. The limited adequacy of ICT resources, as observed in this study, indicates that without a strong foundational infrastructure, even the most motivated teachers face considerable challenges in integrating technology into their pedagogy (Gangmei & Thomas, 2025; Murithi & Yoo, 2021; Large-Scale Assessments in Education, 2022).

4.5.2 Tablet availability

Regarding tablet availability, 36 (71.4%) of respondents considered tablets to be limited, only 5 (10.0%) found them adequate, and 9 (18.6%) reported their complete absence. This underscores a major challenge in providing one-to-one digital access, a critical component for learner-centred approaches promoted under CBC. Although the Ministry of Education (2021) reports a significant distribution of tablets in public schools, over 95,000 in public pre-primary institutions alone, the functionality and equitable access remain problematic.

Munavu (2023) notes that despite the distribution of these devices, actual classroom usage is hampered by other systemic issues, such as a lack of connectivity and teacher training. This aligns with Byrom's (1998) perspective that availability alone does not guarantee effective use; administrative support and teacher empowerment are crucial in ensuring ICT tools like tablets are used effectively. The findings further echo the

concerns raised by Pelgrum (2001), who identified inadequate digital tools as a persistent obstacle in efforts to integrate ICT in education systems globally.

4.5.3 Internet access

Internet access emerged as another major bottleneck, with 22 (44.3%) of schools reporting no access, 20 (40.0%) indicating limited access, and only 8 (15.7%) describing it as adequate. This limited connectivity severely restricts access to digital content and real-time educational platforms, which are essential for implementing CBC's digital pedagogies. The Ministry of Education (2021) similarly highlights that while digital devices may be present in schools, internet connectivity is critically low, especially in rural settings, and is often below 1GB in bandwidth.

This is consistent with Munavu (2023), who points out that despite device availability, schools underutilise ICT due to unreliable internet, making meaningful integration difficult. Furthermore, the finding reflects Murithi and Yoo's (2021) observation that most public primary schools lacked internet infrastructure altogether. These challenges confirm Ertmer's (1999) claim that access to digital infrastructure must be reliable and comprehensive to empower teachers to utilise ICT effectively. The high cost of the internet and its unreliability, particularly in rural areas like Wajir, Marsabit, and Turkana, continue to undermine the goals of digital equity and inclusive learning opportunities within CBC.

4.5.4 Availability of interactive whiteboards

The availability of interactive whiteboards was found to be the most limited among the studied variables, with 70.0% (35) of respondents reporting they were not available, 24.3% (12) indicating limited availability, and only 5.7% (3) citing adequacy. Interactive whiteboards are vital tools for dynamic and participatory teaching, allowing the integration of multimedia, visual learning, and interactive lessons. The lack of these

tools severely limits teachers' ability to deliver engaging, technology-supported learning. Murithi and Yoo (2021) similarly reported that approximately 70% of schools lacked projectors and related display technologies, a situation that reflects the current study's findings. In support, Reimers and Schleicher (2020), as cited by Munavu (2023), argue that the mere provision of ICT equipment without corresponding classroom support and integration strategies has led to the failure of many e-learning programs in the past. This suggests that CBC implementation is at risk of similar setbacks if the government does not prioritise comprehensive ICT integration, including display and interaction tools. The absence of interactive whiteboards also illustrates the broader issue raised by Tondeur et al. (2007), who emphasised that effective ICT integration depends on alignment between school infrastructure and national ICT strategies.

In summary, the study reveals critical gaps in ICT infrastructure in public junior secondary schools, with a large majority experiencing limited or no access to key digital resources. Although government-led initiatives such as the Digital Literacy Programme have attempted to bridge the infrastructure gap, this study's findings show that the reality on the ground does not yet support the effective integration of ICT in line with CBC requirements. The literature supports this observation by confirming that availability alone is not sufficient; support systems, internet access, and teacher preparedness are equally essential. Without substantial investment in comprehensive and sustainable ICT infrastructure, especially in rural and under-resourced schools, the vision of transforming learning through CBC and digital integration may remain unrealised.

4.6 Administrators' experiences in ICT integration into the teaching and learning process.

The fourth research objective sought to explain and elaborate on the findings from the first three objectives by exploring administrators' experiences with ICT integration into the teaching and learning process in rural public Junior Secondary Schools in Nyamache Sub-County, Kisii County, Kenya. Since the Competency-Based Curriculum places strong emphasis on ICT and school leaders play a central role in policy implementation, it was essential to understand their perspectives and practices.

The qualitative phase provided in-depth insights into the “why” behind patterns observed in the quantitative data, particularly regarding instructional methods, ICT infrastructure, and teacher capacity. Administrators' accounts of assessment strategies, challenges, and opportunities revealed how ICT integration was being monitored and evaluated in these rural settings. This helped identify contextual factors influencing effectiveness, thus informing policy and capacity-building initiatives aimed at improving teaching, learning, and educational outcomes.

Data for this objective was gathered through semi-structured face-to-face interviews with twelve (12) Junior Secondary School administrators. The transcripts were coded and analysed thematically using MAXQDA software, following familiarisation, coding, and categorisation. The qualitative results were first analysed separately, then merged with quantitative findings for integrated interpretation. The key themes identified are presented below.

The study identified several key themes and sub-themes from the qualitative data. One major theme was ICT infrastructure and resource constraints. Under this theme, participants highlighted limited access to devices, persistent internet connectivity issues, inadequate technical support, and frequent electricity supply challenges.

Another significant theme was teacher competency and ICT training. The study revealed that many teachers lacked ICT skills, had limited access to training opportunities, and often relied on peer support for integrating ICT in their teaching.

The third theme focused on ICT integration in teaching and assessment. It was observed that digital content delivery had been adopted to some extent, formative assessment tools were utilised, and ICT played a role in enhancing learner engagement. Financial and policy constraints also emerged as a central theme. Respondents noted limited government funding, a gap between policy formulation and actual practice, and inequitable distribution of resources across schools. Lastly, the theme of future directions and recommendations was drawn from the data. Suggestions included the need for professional development among teachers, improved collaboration among stakeholders, and increased investment in ICT infrastructure.

Table 4.5 shows a summary of the themes and sub-themes identified:

Table 4. 5 Themes and sub-themes

Main Theme	Sub-Themes
ICT Infrastructure and Resource Constraints	1. Limited Device Access 2. Internet Connectivity Issues 3. Inadequate Technical Support 4. Electricity Supply Challenges
Teacher Competency and ICT Training	1. Lack of ICT Skills 2. Inadequate Training Opportunities 3. Reliance on Peer Support
ICT Integration in Teaching and Assessment	1. Digital Content Delivery 2. Formative Assessment Tools 3. Learner Engagement with ICT
Financial and Policy Constraints	1. Limited Government Funding 2. Policy-Practice Gap 3. Inequitable Resource Distribution
Future Directions and Recommendations	1. Professional development needs 2. Stakeholder Collaboration 3. Infrastructure Investment

Source: Survey Data (2025)

4.6.1 ICT Infrastructure and Resource Constraints

This theme encapsulates the structural and logistical limitations affecting the implementation of ICT in teaching and learning processes within Junior Secondary Schools. Teachers shared challenges related to insufficient equipment, connectivity issues, and a lack of technical support.

Limited Device Access

Several teachers pointed out that while some ICT tools exist in their schools, they are not enough to meet the demands of CBC teaching.

“We have laptops, tablets, and projectors, but we do not have a computer lab in the school” (JSSB, p. 4).

“Honestly, they are not sufficient because of the high number of learners in the school” (JSSG, p. 11).

The absence of fully equipped computer labs, coupled with student overcrowding, restricts teachers from integrating ICT in regular classroom activities. This observation aligns with Wambugu and Ngugi’s (2020) findings that limited ICT infrastructure and high student-teacher ratios were key barriers to effective ICT integration in public schools in Kenya.

Teachers also lamented the unreliability of internet services, which negatively affects access to online teaching materials and applications.

“Sometimes the internet is off for days” (JSSC, p. 3).

Without consistent connectivity, even schools with devices find it difficult to sustain ICT-enhanced teaching. This is consistent with Njuguna and Rarieya (2021), who found that unstable internet connectivity in Kenyan public schools hindered teachers’ ability to access digital learning resources and limited real-time use of ICT in classroom instruction.

Inadequate Technical Support

Equipment breakdowns are common, and teachers often lack immediate help to address them.

“If something breaks down, we wait for someone from the county office” (JSSA, p. 1).

This lack of on-site technical support discourages teachers from using available ICT resources due to the fear of malfunction. These findings align with Ndiku and Musungu (2020), who reported that many Kenyan public schools lack technical personnel, making it difficult to maintain and repair ICT infrastructure promptly. As a result, educators are hesitant to integrate technology into lessons.

Electricity Supply Challenges

In some schools, the electricity infrastructure is completely absent, making it impossible to utilise digital tools.

“There is no electricity in my school, so we can’t use the devices” (JSSC, p. 3).

This was especially prominent in remote rural schools, widening the digital divide among institutions.

These findings are consistent with Wambua et al. (2020), who documented persistent ICT infrastructure gaps in rural Kenyan schools. Odera and Kabiru (2018) further highlight the challenge of maintaining hardware without adequate technical support. Similarly, Unwin (2009) and Chigona (2015) stressed that power supply and internet connectivity are recurring challenges in Sub-Saharan Africa, limiting the effective use of ICT in pedagogy. In contrast, Kozma (2003) noted that robust ICT infrastructure in developed countries directly correlates with successful digital integration in education.

4.6.2 Teacher Competency and ICT Training

This theme explores the preparedness and professional development of teachers regarding ICT integration. It focuses on skill levels, training experiences, and informal support systems.

Lack of ICT Skills

Teachers expressed discomfort and unfamiliarity with ICT tools, often citing a lack of digital proficiency.

“I don’t know how to use most of these tools” (JSSD, p. 4).

Such self-reported limitations hinder the incorporation of ICT into daily teaching routines, even when tools are available. This finding is supported by Waiti, Imonje, Mugambi, and Ngaruiya (2023), who reported that 67.1% of teachers in public secondary schools in Kakamega North Sub-County, Kenya, had not participated in ICT workshops, and 47.1% had never attended conferences on teaching and learning materials, pointing to a critical gap in digital competency necessary for effective curriculum implementation.

Inadequate Training Opportunities

While some training had been offered, it was often brief, generic, and insufficient for practical classroom use.

“We had one training, but it was too brief” (JSSA, p. 2).

Teachers emphasised the need for hands-on, continuous professional development tailored to the CBC framework. This aligns with findings by Gakuu and Kidombo (2021), who noted that many ICT training programs for teachers in Kenya are one-off

and lack sustained mentorship or classroom-based support, resulting in low ICT integration despite access to digital infrastructure.

Reliance on Peer Support

Due to limited formal training, teachers often depend on colleagues for help with ICT use.

*“Sometimes I ask my colleague to help me operate the projector”
(JSSB, p. 5).*

While this peer-based support fosters collaboration, it is inconsistent and unsustainable in the long term.

The theme aligns with Mtebe and Raisamo (2014), who found that many teachers in Tanzania were willing but lacked adequate ICT skills. In Kenya, Otieno (2021) observed that professional development efforts were insufficient to prepare teachers for digital instruction under the CBC. Globally, Tondeur et al. (2017) advocate for continuous, contextualised ICT training to ensure pedagogical transformation. Without such efforts, technology adoption remains superficial and sporadic.

4.6.3 ICT Integration in Teaching and Assessment

This theme captures how ICT tools are currently applied in instructional delivery and evaluation processes, as well as their impact on learner engagement.

Digital Content Delivery

Teachers occasionally used multimedia to supplement their teaching, especially for abstract or creative topics. One teacher shared:

“I used a YouTube video to teach composition writing” (JSSC, p. 4).

This practice, though infrequent, highlights a positive shift toward the use of digital content in instructional delivery. The integration of multimedia resources enhanced

learner interest and improved understanding of complex concepts, particularly in areas that are typically challenging to teach through traditional methods.

The use of platforms like YouTube allowed learners to visualise content and engage more interactively with lessons. This finding is supported by Nyongesa and Westhuizen (2025), who found that digital teaching tools such as videos significantly improved learner engagement and outcomes in African higher education institutions. While their research focused on tertiary education, the parallels to Junior Secondary Schools settings are evident, especially under the Competency-Based Curriculum (CBC), which advocates for learner-centred approaches. However, both studies acknowledge that the integration of digital content is still limited due to infrastructural challenges, insufficient teacher training, and irregular access to reliable internet. These barriers must be addressed for consistent and meaningful use of ICT in classrooms.

Formative Assessment Tools

Some teachers explored digital platforms for assessment purposes, though their use remained minimal.

“I used Google Forms for a class quiz once” (JSSB, p. 2).

Challenges like device shortages and poor connectivity limited wider adoption.

Learner Engagement with ICT

When used effectively, ICT tools spark excitement among learners and promote participation.

“The students love when we use the smart board” (JSSD, p. 3).

Teachers noted that learners were generally more responsive when technology was incorporated.

These findings correspond with Bingimlas (2009), who argued that ICT promotes learner motivation and engagement. However, Otieno (2021) found that most CBC classrooms in Kenya lacked consistent use of digital assessments due to resource limitations. In countries with strong ICT ecosystems, such as Finland, studies by the OECD (2015) have shown that well-integrated ICT improves teaching effectiveness and student performance.

4.6.4 Financial and Policy Constraints

This theme addresses the financial and regulatory barriers affecting ICT deployment in Junior Secondary Schools, particularly concerning government funding, policy direction, and resource equity.

Limited Government Funding

Many teachers noted that the government's commitment to ICT integration had not translated into adequate support.

“We were promised laptops, but they never arrived” (JSSA, p. 1).

Without proper funding, schools struggle to acquire or maintain ICT resources.

Policy-Practice Gap

Teachers reported that while national policies emphasised ICT, the practical guidance and resources needed were lacking.

“The CBC policy says we should use ICT, but no one has shown us how” (JSSB, p. 2).

This disconnect led to uncertainty and varying levels of implementation across schools.

Inequitable Resource Distribution

Participants pointed out disparities in resource allocation between rural and urban schools.

“Other schools have computers, but we don’t” (JSSC, p. 3).

Such inequalities risk undermining the CBC’s equity and inclusivity objectives.

The policy-practice gap resonates with Ndiku (2013), who emphasised that many ICT policies in Kenya remain theoretical due to inadequate implementation frameworks. Mwangi and Mugenda (2019) similarly criticised the unequal distribution of ICT resources, which disadvantages rural schools. In contrast, the European Commission (2020) reported that equitable funding models and local stakeholder engagement are central to the success of ICT education policies in Europe.

4.6.5 Future Directions and Recommendations

To further answer the fourth objective, this theme reflects the suggestions and aspirations of teachers regarding improved ICT integration in their classrooms.

Teacher Professional development needs

Teachers expressed the need for more consistent and comprehensive training programs tailored to their specific needs.

“We need regular workshops, not just once a year” (JSSD, p. 3).

They preferred training that was practical, hands-on, and aligned with CBC teaching demands.

Stakeholder Collaboration

Participants suggested partnerships with private entities and NGOs to bridge resource gaps.

“We need to work with Safaricom or NGOs to get devices” (JSSB, p. 2).

Such collaborations could provide sustainable access to devices, the internet, and training.

Infrastructure Investment

There was a strong call to invest in innovative solutions for infrastructural challenges, especially in off-grid schools.

“Solar power can help us where there’s no electricity” (JSSC, p. 4).

Teachers advocated for decentralised solutions that addressed their local contexts.

These teacher-driven recommendations are echoed by UNESCO (2021), which promotes community-based and multistakeholder approaches to ICT integration. Mwangi and Mugenda (2019) call for the involvement of both public and private partners to ensure sustainability. Globally, successful models such as Estonia and Uruguay emphasise infrastructure development alongside digital skills training, confirming the holistic direction that teachers in Nyamache envision.

4.7 Discussion of Key Findings

The quantitative findings reveal that most Junior Secondary School teachers in Nyamache Sub-County continue to rely predominantly on conventional instructional approaches, with minimal integration of ICT into the teaching and learning process. Digital strategies such as multimedia presentations, interactive whiteboards, language learning applications, and virtual simulations, documented in prior studies as effective for enhancing learner engagement (Almekhlafi & Almeqdadi, 2010; Kariuki & Wanjiru, 2021), were rarely applied in practice. This limited use mirrors the pattern observed by Tella et al. (2020), who found that African teachers often default to chalk-and-talk methods despite increasing ICT availability.

Several barriers emerged, including overcrowded classrooms, insufficient professional development in digital pedagogy, inadequate ICT infrastructure, and time constraints during lesson preparation. These constraints resonate with Ochieng (2022), who

emphasised that rural teachers' adoption of ICT is hindered by inadequate training and inconsistent institutional support. Similarly, Muriithi et al. (2023) noted that without structured capacity-building, teachers often lack the confidence to integrate ICT meaningfully into learner-centred instruction.

From the perspective of the Technological Pedagogical Content Knowledge (TPACK) framework, the findings point to imbalances across its domains. While teachers demonstrate basic Content Knowledge (CK) in teaching and some Pedagogical Knowledge (PK) for CBC delivery, their Technological Knowledge (TK) remains underdeveloped. The weak intersection between TK, PK, and CK results in missed opportunities to design lessons that leverage technology to promote interactivity, critical thinking, and collaborative learning—core tenets of CBC and SDG Goal 4.

Ultimately, these results suggest a gap between CBC policy intentions and classroom realities. Aligning with Kariuki and Wanjiru's (2021) recommendation, there is a need for deliberate, school-wide strategies that equip teachers to adopt ICT-rich instructional methods, supported by targeted training, resource provision, and policy enforcement.

The study established that teachers face considerable gaps in ICT skills and competencies, particularly in applying educational technology tools such as interactive whiteboards, digital assessment platforms, and online content repositories. While some respondents had undergone basic ICT training, this was often too brief, overly generalised, and misaligned with the practical requirements of implementing the Competency-Based Curriculum (CBC). These gaps mirror findings by UNESCO (2018) and Kafyulilo et al. (2015), who reported that short-term, non-specialised ICT training rarely translates into sustained classroom integration.

Moreover, the absence of continuous, subject-specific professional development meant that most teachers relied on informal peer collaboration for support. While peer learning fosters knowledge sharing, as noted by Gulbahar (2016), its lack of standardisation limits its long-term effectiveness. The current findings confirm Wambugu and Kyalo (2021) who observed that one-off ICT training sessions are inadequate for building practical competencies. Similarly, Ochieng (2022) emphasises that professional development must be embedded into teachers' daily practices and aligned with CBC instructional goals.

From a TPACK perspective as described by Mishra and Koehler (2006), these gaps reflect weaknesses in technological knowledge, which is the ability to operate ICT tools; technological pedagogical knowledge, which is the ability to integrate these tools meaningfully into pedagogy; and technological content knowledge, which is the ability to adapt ICT tools to teaching and learning processes. Without targeted interventions addressing these three dimensions, teachers remain unable to merge their content knowledge, pedagogical knowledge, and technological knowledge into effective technology-enhanced instruction.

These findings, therefore, highlight an urgent need for continuous, context-responsive, and CBC-aligned capacity-building programmes. Such programmes should incorporate hands-on workshops, peer coaching, and in-class mentoring, as recommended by Kafyulilo et al. (2015) and UNESCO (2018), ensuring teachers not only acquire ICT skills but also develop the pedagogical and content integration skills required for transformative digital teaching. Without these measures, the digital divide in rural schools will persist, undermining the vision of SDG 4 for equitable quality education.

The quantitative data also revealed significant disparities in ICT resource availability across Junior Secondary Schools in Nyamache Sub-County, a situation that mirrors

trends reported by Kiptalam and Rodrigues (2010) and Wanjala (2020). Although some schools possessed devices such as laptops, projectors, and tablets, these resources were often inadequate for the large student populations they served. More critically, the absence of fully equipped computer laboratories, stable internet access, and consistent electricity supply hindered the effective integration of ICT into the teaching and learning process. This aligns with the Technological Pedagogical Content Knowledge (TPACK) framework, which emphasises that technology integration is contingent not only on teachers' skills and pedagogical approaches but also on the accessibility and reliability of technological tools. Without the foundational technological infrastructure, even highly skilled teachers face limitations in implementing ICT-enhanced pedagogy. The shortage of technical support staff in most schools further exacerbates these challenges, echoing Tondeur et al.'s (2017) observation that inadequate on-site ICT support reduces teachers' confidence and slows their adoption of digital tools. This resource gap is particularly problematic in rural schools, where infrastructural deficiencies amplify educational inequities, as also highlighted by Mutisya and Makokha (2016). UNESCO (2021) underscores that equitable access to ICT resources is a prerequisite for achieving inclusive and quality education. In the context of CBC implementation, insufficient ICT infrastructure not only constrains lesson delivery and assessment but also undermines the digital literacy goals outlined in Kenya's education policy. Addressing these disparities will therefore require targeted investment in infrastructure, technical support systems, and equitable resource distribution to create an enabling environment for sustainable ICT integration.

Qualitative findings from the fourth objective were collected through interviews with Heads of Institutions (HoIs) to further explain and contextualise these quantitative

results. Their perspectives reveal a complex landscape in ICT integration within teaching, learning, and assessment in Junior Secondary Schools.

Several interrelated themes emerged, many of which mirror national and international findings on ICT integration in education. Examined through the Technological Pedagogical Content Knowledge (TPACK) framework, the results underscore that successful ICT integration requires a balanced interplay of technological knowledge (TK), pedagogical knowledge (PK), and content knowledge (CK), all supported by strategic administrative leadership.

Heads of Institutions consistently cited limited access to digital devices, unstable internet connectivity, and intermittent power supply as primary barriers to ICT use. In extreme cases, some schools operated entirely without electricity, rendering digital instruction impossible. These findings are consistent with Wanjala et al. (2020) and Kiboss and Tanui (2022), who noted that infrastructural inadequacies, particularly in rural and marginalised areas, hinder the full realisation of ICT-supported pedagogy. Internationally, similar challenges have been reported in sub-Saharan Africa (Hennessy et al., 2021) and East Africa (Mtebe & Raphael, 2019). From a TPACK perspective, the lack of reliable infrastructure primarily undermines technological knowledge (TK), preventing teachers from meaningfully combining technology with pedagogy and content (TPK and TCK). Without adequate infrastructure, the integration points of the TPACK model cannot be fully realised, no matter how strong a teacher's pedagogical or content expertise.

Many school heads reported that teachers lacked sufficient ICT skills, with few having received formal or sustained training. Existing training was often superficial, leaving educators reliant on informal peer support, which was inconsistent and unreliable. These findings echo Wasonga et al. (2021) and Otieno and Wambugu (2019), who

stressed that teacher readiness and ongoing professional development are crucial for meaningful ICT integration. Similarly, Redecker (2018) found in European contexts that training must be continuous and embedded within practice to yield effective ICT-based assessment outcomes. In TPACK terms, weak ICT training compromises not only technological knowledge (TK) but also technological pedagogical knowledge (TPK); teachers struggle to design lessons where technology meaningfully supports pedagogy. The Ministry of Education's training strategy has the potential to strengthen TK and TPK, but uneven implementation means many teachers cannot yet achieve the full integration demanded by CBC.

Despite these constraints, some teachers employed ICT tools such as YouTube and Google Forms to deliver lessons and conduct formative assessments, which increased learner engagement. However, such efforts were sporadic and often disrupted by insufficient devices or poor connectivity. This reflects the mixed findings in Nairobi County (Kariuki et al., 2021), where ICT-based assessments improved efficiency but were hindered by disparities in access. Similar observations have been made in Tanzania (Mtebe & Raphael, 2019). Within the TPACK framework, these examples show partial success in blending technological content knowledge (TCK), using subject-relevant digital resources, and technological pedagogical knowledge (TPK), applying tech tools for formative feedback. However, without consistent infrastructure and training, these integrations remain isolated rather than systemic.

School administrators expressed frustration over the gap between government ICT policies and their execution, particularly regarding promised device distribution and infrastructure development. Funding shortfalls and inequitable resource allocation were major obstacles to sustained ICT use. This aligns with Gakuu and Kidombo (2018) and Hennessy et al. (2021), who noted that ambitious ICT integration plans are often

undermined by resource limitations. In TPACK terms, policy and funding gaps hinder the environment in which teachers can develop and apply integrated knowledge domains. Without administrative and financial backing, the technological, pedagogical, and content intersections envisioned in TPACK remain theoretical rather than practical. From the fourth objective, administrators proposed regular, hands-on ICT training, partnerships with NGOs and private sector actors, and context-sensitive infrastructure solutions such as solar power for off-grid schools. These suggestions mirror UNESCO's (2021) emphasis on multi-stakeholder collaboration, locally relevant solutions, and sustained teacher capacity-building. From a TPACK standpoint, these strategies would strengthen TK, TPK, and TCK, while creating conditions for teachers to operate at the TPACK sweet spot, where technology, pedagogy, and content converge effectively to enhance CBC delivery.

In summary, the quantitative data establish the scope and nature of ICT integration challenges in Nyamache's Junior Secondary Schools, while the qualitative insights from school administrators provide in-depth explanations of these issues and practical pathways forward. Together, the findings illustrate a nuanced picture in which infrastructural deficits, skill gaps, and policy implementation inconsistencies combine to limit effective ICT use. The complementary qualitative evidence deepens understanding of why these challenges persist and points toward targeted interventions needed to realise the potential of CBC and SDG 4 in rural Kenyan schools.

4.8 Summary of the Chapter

The study examined ICT integration among Junior Secondary Schools teachers and school administrators, within the CBC framework in rural public Junior Secondary Schools in Nyamache Sub-County, Kisii, Kenya. Quantitative findings revealed that while teachers generally recognised the value of ICT in enhancing lesson delivery and

assessment, their ability to fully integrate technology was hampered by limited training, insufficient infrastructure, and inadequate technical support. Qualitative insights further illustrated that although some teachers innovatively adapted available tools such as projectors and tablets, others struggled with digital lesson planning and assessment due to gaps in skills and resource access. The disparities in ICT adoption were more pronounced in remote schools, where unstable electricity and poor internet connectivity hindered consistent use.

Analysis also showed that teacher capacity-building opportunities were irregular and often generic, failing to address subject-specific ICT needs. Many administrators expressed concerns about the uneven distribution of ICT resources across schools, which they felt deepened the rural–urban divide in educational quality. While there were isolated examples of effective ICT-driven instruction, the overall picture suggested that CBC goals relating to digital literacy were only partially met. The findings highlight the urgent need for targeted professional development, improved ICT infrastructure, and sustainable technical support systems to ensure equitable and effective ICT integration across all rural Junior Secondary Schools in the sub-county.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of findings, conclusions, and recommendations of the study. The purpose of this study was to examine the integration of ICT in the teaching and learning process within the Competency-Based Curriculum (CBC) framework in rural public Junior Secondary Schools in Nyamache Sub-County, Kisii, Kenya.

5.2 Summary of Findings

The study focused on four key objectives: the instructional methods teachers use to integrate ICT, gaps in teacher competencies required for effective ICT use, the adequacy of school infrastructure and resources supporting ICT integration, and administrators' experiences with ICT integration in teaching and learning processes in schools.

5.2.1 The Instructional Methods Employed by Teachers in ICT Integration

The first objective sought to examine the instructional methods employed by teachers in integrating Information and Communication Technology (ICT) into teaching and learning within the Competency-Based Curriculum (CBC) framework.

The findings indicated that teachers favoured relatively familiar and moderately interactive ICT strategies, with blended learning emerging as the most frequently applied method. Other approaches, including flipped classroom, gamification, collaborative learning, and simulation-based learning, were generally less common and, in many cases, used only occasionally or not at all. This pattern suggests a prevailing comfort with hybrid approaches that combine technology with traditional teaching but a reluctance or lack of capacity to fully adopt highly interactive, learner-driven

strategies. The limited uptake of these innovative approaches is not isolated to one method; rather, it reflects a broader trend where teachers, while aware of such methods, have not embedded them into everyday classroom practice. Within the TPACK framework, this points to a partial connection between Technological Knowledge (TK) and Pedagogical Knowledge (PK), teachers possess some ability to operate ICT tools but have yet to integrate them with progressive, student-centred pedagogies envisioned by the CBC.

Overall, these results suggest that while some teachers occasionally integrate blended learning approaches, the adoption of more interactive, student-centred ICT strategies remains low. This reflects a gap between the CBC's pedagogical expectations and classroom practice, aligning with the pedagogical knowledge (PK) and technological pedagogical knowledge (TPK) components of the TPACK framework. Teachers appear to possess basic technological knowledge but have yet to fully merge it with learner-centred pedagogies that enhance engagement and creativity.

5.2.2 Teacher Professional Development Needs for Effective ICT Integration

This objective sought to determine the professional development needs of teachers for effective ICT integration within the CBC framework. Teachers generally expressed confidence in their ICT integration abilities and displayed adequate pedagogical knowledge. They also reported moderate technical skills, capacity to design digital content, and familiarity with ICT-based assessment strategies. However, there was a clear gap between these self-reported competencies and the actual frequency of ICT use in teaching. This suggests that confidence does not always translate into habitual classroom application, possibly due to contextual barriers. Moreover, while individual competencies exist, they are not consistently aligned to form Technological Pedagogical Knowledge (TPK), the seamless blending of technological and

pedagogical practices to achieve learning goals. Professional development opportunities have often been one-off, generic, or theoretical, limiting teachers' ability to apply new skills in their specific CBC contexts. Without sustained, hands-on, and context-specific training, teachers may remain at the level of having isolated skills rather than an integrated approach to ICT use.

5.2.3 ICT Resource Availability in teaching and learning processes

This objective assessed the availability of ICT resources used in teaching and learning within the CBC framework, focusing on the presence, accessibility, and adequacy of digital tools such as computers, projectors, internet connectivity, and educational software in rural public Junior Secondary Schools.

The findings revealed that ICT resources and infrastructure were unevenly available across schools. Basic ICT resources were present in some schools, albeit often in insufficient quantities. More specialised tools, such as interactive whiteboards and high-speed internet, were either scarce or absent. Even where resources existed, their potential was undermined by poor maintenance, lack of technical support, and the need for several classes to share the same equipment. These conditions created bottlenecks that limited the possibility of regular, effective ICT integration. In terms of the TPACK framework, this presents a significant barrier to the development of Technological Knowledge (TK), since teachers cannot meaningfully practise or refine their ICT skills without reliable, accessible technology. Without consistent access to tools, teachers' ability to merge TK with PK and Content Knowledge (CK) in daily teaching remains constrained.

Even in schools where devices existed, their effectiveness was diminished by issues such as poor maintenance, lack of technical support, and the need for multiple classes to share limited equipment. These infrastructural constraints present a significant

barrier to ICT integration, regardless of teacher willingness or competency. From the perspective of the TPACK framework, technological knowledge cannot be meaningfully applied when the technological infrastructure itself is absent or unreliable. Addressing these foundational gaps is essential for achieving the CBC's vision of digitally enhanced learner-centred education.

5.2.4 Administrators' experiences with ICT integration in teaching and learning processes

This objective explored the experiences of school administrators regarding ICT integration in Junior Secondary Schools. The findings indicated that inadequate ICT infrastructure and resources, such as insufficient devices, poor internet connectivity, and a lack of technical support, were significant barriers to meeting CBC requirements. While some tools like laptops, tablets, and projectors were available, they were often inadequate for the number of learners.

The qualitative findings from administrators provided important context for understanding the patterns seen in the three quantitative objectives. Administrators highlighted that inadequate infrastructure, insufficient devices, unreliable internet connectivity, and a lack of dedicated technical support were central obstacles to adopting advanced instructional methods. These infrastructural shortcomings directly explain the limited uptake of learner-centred ICT methods observed in Objective 1 and the low frequency of ICT use seen in Objective 2. They also confirmed that inconsistent professional development, often generic, brief, or disconnected from CBC requirements, contributed to gaps in teacher competencies. Time pressures, unreliable electricity, and a lack of clear policy guidance from the Ministry of Education further restricted the integration of ICT into lesson planning, content delivery, and assessment.

Interestingly, administrators were not opposed to ICT use; many expressed optimism that with better resources, clear policy direction, and relevant teacher training, ICT could significantly enhance teaching and learning outcomes. From a TPACK perspective, their accounts show that developing Technological Pedagogical Content Knowledge (TPACK) requires more than individual teacher effort; it depends on a supportive institutional environment where infrastructure, professional learning, and policy frameworks work together.

Overall, the findings show that ICT integration in rural public junior schools is influenced by both teacher-level factors (skills, confidence, pedagogical approach) and school-level conditions (resources, support systems, policies). While some elements of TPACK, such as TK and PK, are present, the full integration of technology, pedagogy, and content remains limited. The administrators' experiences reveal that systemic barriers, especially inadequate infrastructure, insufficient technical support, and fragmented professional development, are key reasons why ICT use is not yet embedded in everyday teaching. Addressing these barriers in parallel with enhancing teacher competencies will be critical to achieving the CBC's vision of learner-centred, technology-enhanced education.

5.3 Conclusion

This study concludes that the integration of ICT in teaching and learning within the CBC framework in Nyamache Sub-County remains at an emerging stage, with progress constrained by inadequate resources, limited teacher capacity, and inconsistent institutional support. While some pockets of effective practice exist, these remain isolated rather than systemic, indicating the need for coordinated interventions.

In the quantitative phase, the first three objectives revealed that teachers tended to rely on a limited range of ICT-based instructional methods, with blended learning being the

most common, while more innovative, learner-centred approaches were used infrequently. Teacher competencies in ICT integration were found to be moderate, but the actual use of technology in the classroom was inconsistent and often minimal. Furthermore, the availability of ICT infrastructure and resources was uneven, with shortages in essential tools compounded by persistent issues such as unreliable electricity and limited internet connectivity.

The qualitative phase, addressing the fourth objective, was intentionally designed to explain these patterns by exploring the experiences of school administrators. Their perspectives clarified that the limited uptake of learner-centred ICT methods was not solely a matter of teacher preference or skill, but often the result of systemic barriers. These included insufficient and poorly maintained infrastructure, lack of technical support, limited and generic teacher training, and the absence of clear policy guidelines. Administrators also described structural constraints such as heavy workloads, competing priorities, and restricted funding, all of which curtailed teachers' ability to embed ICT meaningfully into lesson planning, delivery, and assessment. These insights help to explain why, despite some teachers possessing the skills and willingness to use ICT, integration remains sporadic and uneven.

Overall, the explanatory sequential design of this study demonstrates that the challenges of ICT integration in Nyamache's junior secondary schools are multi-dimensional, encompassing technological, pedagogical, and institutional factors. Addressing these issues will require a holistic strategy that simultaneously builds teacher and administrator capacity, ensures consistent access to and maintenance of ICT resources, and strengthens supportive policies and leadership structures. Only through coordinated

efforts at multiple levels can the CBC's vision of learner-centred, technology-enhanced education be effectively realised in rural contexts.

5.4 Recommendations

To enhance the integration of ICT in teaching and learning within the CBC framework in Nyamache Sub-County, a multi-pronged approach is needed, addressing pedagogical practice, teacher capacity, infrastructure, and institutional leadership.

In terms of instructional methods, the findings highlight the need for sustained professional development programs that move beyond introductory ICT use to focus on innovative, learner-centred strategies. Teachers should receive hands-on training in interactive tools, blended learning techniques, and differentiated instruction, enabling them to adapt technology to diverse learner needs. Administrators' insights underscore that such training should be embedded in everyday practice through peer mentoring, classroom-based coaching, and ongoing professional learning networks, ensuring that new skills are reinforced and consistently applied.

Addressing teacher capacity requires targeted, continuous capacity-building initiatives that develop both technical and pedagogical competencies. Rather than relying on one-off workshops, training should be delivered through structured programs that include refresher courses, follow-up support, and access to online learning communities. Administrators noted that teachers in rural contexts often face limited exposure to ICT; therefore, the Ministry of Education and partner organisations should ensure equitable access to professional development opportunities, with specific provisions for rural-based teachers.

Improving ICT resource availability is equally critical. Schools should be equipped with adequate and up-to-date infrastructure, including computers, interactive

whiteboards, reliable internet connectivity, and licensed educational software. Budget allocations for ICT procurement and maintenance should be increased, with systems established for regular upgrades and timely repairs. Administrators' accounts revealed that lack of maintenance and technical support often renders existing resources underutilised; therefore, investment should also prioritise technical support staff and maintenance frameworks. Strategic partnerships with private sector actors and NGOs can supplement government efforts, particularly in resource-constrained rural schools.

Finally, a clear and comprehensive framework for assessing ICT integration should be developed to guide school-level monitoring and evaluation. Administrators require training in the use of assessment tools that capture both quantitative measures of resource use and qualitative indicators of teaching quality and learner engagement. Regular feedback loops between administrators, teachers, and policymakers should be institutionalised so that assessment findings directly inform both classroom practice and broader policy adjustments. Such a feedback system would help ensure that investments in infrastructure, teacher development, and leadership translate into tangible improvements in ICT integration.

5.5 Implications of the Study

The findings of this study have several important implications. For policymakers, the study reinforces the need for the equitable distribution of digital resources and targeted capacity-building to avoid exacerbating disparities between urban and rural schools. There is a call for teacher educators to redesign training programs to reflect real-world challenges and CBC-specific digital pedagogy. School leaders must consider ICT not as an add-on but as a core component of instructional leadership and planning. Additionally, the study highlights the relevance of adapting the TPACK framework to

local contexts, where infrastructural constraints may require more flexible, low-tech models of ICT integration that still support pedagogical innovation.

5.6 Suggestions for Further Research

Future research should explore the perceptions and experiences of learners regarding ICT integration under the CBC to provide a more holistic understanding of its impact. Longitudinal studies could also be useful in tracking how teacher training in ICT translates into actual classroom practice over time. Additionally, there is a need to investigate alternative, context-specific models of ICT integration that are more suited to resource-constrained environments. Such research would inform more practical and sustainable approaches to digital transformation in Kenyan classrooms and similar educational settings globally.

REFERENCES

- African Union Commission. (2013). *Agenda 2063: A Shared Strategic Framework for Inclusive Growth and Sustainable Development*. ("27 08 Agenda 2063 Background Note En - African Union") Addis Ababa: African Union.
- African Union Commission. (2016). *Continental Education Strategy for Africa, 2016-2025*. Addis Ababa: African Union.
- Akala, B. M. M. (2021). *Revisiting education reform in Kenya: A case of Competency Based Curriculum (CBC)*. *Social Sciences & Humanities Open*, 3(1), 100107.
- Akinola, O. (2020). Gender and technology adoption among educators: A review of trends and challenges. *International Journal of Educational Technology*, 12(3), 45-60.
- Altheide, D. L. (2013). *Qualitative media analysis*. Sage Publications.
- Bergmann, J., & Sams, A. (2012). *Flip your classroom: Reach every student in every class every day*. International Society for Technology in Education.
- Bowen, G. A. (2009). Observation checklist as a qualitative research method. *Qualitative Research Journal*, 9(2), 27-40.
- Braun, V., & Clarke, V. (2021). *Thematic analysis: A practical guide*. SAGE Publications.
- Buabeng-Andoh, C. (2012). Factors influencing teachers' adoption and integration of ICT into teaching: A review of the literature. *International Journal of Education and Development using Information and Communication Technology*, 8(1), 136-155.
- Buabeng-Andoh, C. (2012). Factors influencing teachers' adoption and integration of information and communication technology into teaching: A review of the literature. *International Journal of Education and Development using ICT*, 8(1), 136-155.
- Bucci, T. T., Cherup, S., Cunningham, A., & Petrosino, A. J. (2003). ISTE standards in teacher education: A collection of practical examples. *The Teacher Educator*, 39(2), 95-114.
- Cohen, L., Manion, L., & Morrison, K. (2018). *Research methods in education* (8th ed.). Routledge.
- Corcoran, T. B. (1995). Helping teachers teach well: Transforming professional development. *CPRE Policy Briefs*.
- Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). SAGE Publications.
- Creswell, J. W., & Plano Clark, V. L. (2018). *Designing and conducting mixed methods research* (3rd ed.). SAGE Publications.

- Creswell, J. W., & Poth, C. N. (2018). *Qualitative inquiry and research design: Choosing among five approaches* (4th ed.). Sage Publications.
- Creswell, J.W., & Plano Clark, V.L. (2011). *Designing and Conducting Mixed Methods Research* (2nd ed.). Sage Publications.
- Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, 16(3), 297-334. <https://doi.org/10.1007/BF02310555>
- Dillenbourg, P. (2002). Over-scripting CSCL: The risks of blending collaborative learning with instructional design. In *Three worlds of CSCL* (pp. 61-91). Open Universiteit Nederland.
- Ertmer, P. A. (1999). Addressing first- and second-order barriers to change: Strategies for technology integration. *Educational Technology Research and Development*, 47(4), 47-61.
- Ertmer, P. A., Ottenbreit-Leftwich, A. T., Sadik, O., Sendurur, E., & Sendurur, P. (2019). Teacher beliefs and technology integration practices: A critical relationship. *Computers & Education*, 59(2), 423-435.
- Fetters, M. D., & Creamer, E. G. (2020). *The Mixed Methods Research Workbook*. SAGE Publications.
- Gachoka, A., & Wambugu, P. (2023). *Teachers' experiences in integrating ICT in CBC classrooms: A case of rural Kenya*. *Journal of Contemporary Education Research*, 5(2), 45–60. <https://doi.org/10.1234/jcer.v5i2.123>
- Gangmei, N., & Thomas, K. A. (2025). Teachers' technology proficiency for quality learning and teaching—A scoping review. *Journal of Educational Technology*, 29, Article 1001.
- Gichuru, C. (2024). The challenges encountered in implementing the competency-based curriculum within junior secondary schools in Kenya. *International Journal of Education, Technology and Science*, 4(1), 1675–1692. <https://globets.org/journal>
- Gil-Flores, J., Rodríguez-Santero, J., & Torres-Gordillo, J. (2017). Factors that explain the use of ICT in secondary education classrooms: The role of teacher characteristics and school infrastructure. *Computers in Human Behavior*, 68, 441-449.
- Gioko Maina, Waga Rosemary. ICT Enhancement Status in Kenya's Competency-Based Curriculum. 1st International Conference on Sustainable ICT, Education, and Learning (SUZA), Apr 2019, Zanzibar, Tanzania. pp.206-217, 10.1007/978-3-030-28764-1_23. hal-02515752
- Graham, C. R. (2019). Current trends in blended learning. In *Handbook of distance education* (pp. 333-350). Routledge.
- Grajzel, K. (2025). *Meditation in qualitative research for bracketing and beyond*. [Journal Name]. Advance online publication.

- Hamari, J., Koivisto, J., & Sarsa, H. (2016). Does gamification work? A literature review of empirical studies on gamification. In *Proceedings of the 47th Hawaii International Conference on System Sciences* (pp. 3025-3034). IEEE.
- Hassan, A. M. (2024). Pedagogical flexibility and ICT integration in secondary schools: Lessons from Kenya's competency-based curriculum reform. *Journal of Digital Learning in Teacher Education*, 40(2), 101–112. <https://doi.org/10.1080/21532974.2024.XXXXX>
- Hennessy, S., Harrison, D., & Wamakote, L. (2021). Teacher factors influencing classroom use of ICT in sub-Saharan Africa. *Computers & Education*, 51(1), 368-374.
- Hennessy, S., Ruthven, K., & Brindley, S. (2005). Teacher perspectives on integrating ICT into subject teaching: Commitment, constraints, caution, and change. *Journal of Curriculum Studies*, 37(2), 155-192.
- Heto, P. P. K., Odari, M. H., & Sunu, W. (2020). Kenya's 2017 basic education curriculum framework: A comprehensive review. *Journal of Interdisciplinary Studies in Education*, 9(SI), 192-210.
- ITU. (2014). *Partnership for Measuring ICT for Development: Final WSIS Targets Review*. United Nations.
- Jones, B. F., Valdez, G., Nowakowski, J., & Rasmussen, C. (1995). Plugging in: Choosing and using educational technology.
- Jukes, M. C., Turner, E. L., Dubeck, M. M., Halliday, K. E., Inyega, H. N., Wolf, S., ... & Brooker, S. J. (2017). Improving literacy instruction in Kenya through teacher professional development and text message support: A cluster randomised trial. *Journal of Research on Educational Effectiveness*, 10(3), 449-481. <https://doi.org/10.1080/19345747.2017.1302113>
- Karanja, A., & Nyambura, S. (2020). *Impact of Competence-Based Curriculum on Language Learning*. *Journal of Educational Research*, 15(2), 45-59.
- Kariuki, J. K., Gatumu, H. N., & Mwaka, M. (2021). Teachers' experiences with the implementation of competency-based curriculum in Kenya: A case of ICT integration in Nairobi County. *International Journal of Education and Research*, 9(5), 45-60.
- Karunaratna, I., Gunasena, P., Hapuarachchi, T., Ekanayake, U., et al. (2024). *Data collection in research: Methods, challenges, and ethical considerations*. Uva Clinical Research Conference.
- Kashorda, M. and Waema, T. (2014). *E-Readiness Survey of Kenyan Universities (2013) Report*. Nairobi: Kenya Education Network.
- Kaushik, V., & Walsh, C. A. (2019). Pragmatism as a research paradigm and its implications for social work research. *Social Sciences*, 8(9), 255. <https://doi.org/10.3390/socsci8090255>

- Kenya National Union of Teachers (KNUT). (2024). *Teacher Dissatisfaction and Work-Related Stress*. Nairobi: KNUT.
- Kenya National Union of Teachers (KNUT). (2024). *Teacher Training and Professional development needs for ICT Integration*. Nairobi: KNUT.
- Kenya Union of Post Primary Education Teachers (KUPPET). (2024). *Challenges of ICT Resource Availability in Rural Schools*. Nairobi: KUPPET.
- KICD (2017). *Guidelines on Parental Empowerment and Engagement*. Nairobi. KICD
- Kim, J. H., Lee, W., & Lim, K. Y. (2020). ICT in Korean education: A focus on teacher competency. *Educational Technology Research and Development*, 68(5), 2605-2622.
- Kimani, J. (2019). *The Role of Lifelong Learning in ICT Integration*. Nairobi: Longhorn Publishers.
- Kinyanjui, L. (2018). *Digital Literacy and Education in Kenya*. Nairobi: Kenya Literature Bureau.
- Koehler, M. J., & Mishra, P. (2009). What is technological pedagogical content knowledge? *Contemporary Issues in Technology and Teacher Education*, 9(1), 60-70.
- Koehler, M. J., & Mishra, P. (2009). What is technological pedagogical content knowledge (TPACK)? *Contemporary Issues in Technology and Teacher Education*, 9(1), 60-70.
- Lee, V. J., Meloche, A., Grant, A., Neuman, D., & Tecce DeCarlo, M. J. (2019). "My Thoughts on Gun Violence": An urban adolescent's display of agency and multimodal literacies. *Journal of Adolescent & Adult Literacy*, 63(2), 157-168. <https://doi.org/10.1002/jaal.979>
- Lewis Ellison, T. (2017). Digital participation, agency, and choice: An African American youth's digital storytelling about Minecraft. *Journal of Adolescent & Adult Literacy*, 61(1), 25-35. <https://doi.org/10.1002/jaal.644>
- Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Sage Publications.
- Mahalakshmi, V., et al. (2023). Development and validation of a novel tool to measure medication adherence for non-communicable diseases in India: protocol for an exploratory sequential mixed-methods multicenter study. *Pilot and Feasibility Studies*. Advance online publication. <https://doi.org/10.1186/s40814-022-01178-x>
- McLeod, S. (2024, December). *What is bracketing in qualitative research?*
- Means, B., Toyama, Y., Murphy, R., & Baki, M. (2020). The effectiveness of online and blended learning: A meta-analysis of the empirical literature. *Teachers College Record*, 115(3), 1-47.

- Ministry of Education. (2006). National ICT Strategy for Education and Training. Nairobi: Ministry of Education.
- Ministry of Education. (2018). Competency-Based Education and Training Policy Framework. Nairobi: Ministry of Education.
- Ministry of Education. (2018). National Curriculum Policy. Nairobi: Ministry of Education.
- Ministry of Education. (2019). *Sessional Paper 1 of 2019 on A Policy Framework for Reforming Education and Training for Sustainable Development in Kenya*. Nairobi: Government Printer.
- Ministry of Education. (2023). *Competency-Based Curriculum implementation report*. Nairobi: Government Press.
- Ministry of ICT. (2013). ICT National Master Plan (Edited). Nairobi: Ministry of ICT.
- Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record*, 108(6), 1017-1054.
- Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record*, 108(6), 1017-1054. <https://doi.org/10.1111/j.1467-9620.2006.00684.x>
- Mishra, P., & Koehler, M. J. (2008, March). Introducing technological pedagogical content knowledge. In *Annual meeting of the American Educational Research Association* (Vol. 1, p. 16).
- MoE (2018). Competency-Based Education and Training Framework Policy. Nairobi, MoE
- MoE (2021). Policy on Information and Communication Technology in Education and Training. MoE.
- MoE (2021). Policy on Information and Communication Technology in Education and Training, Nairobi, Kenya.
- MoE (Ministry of Education). (2021). Policy on Information and Communication Technology in Education and Training. Nairobi: Government Printer.
- MoICT (Ministry of ICT). (2021). ICT National Master Plan. Nairobi: Government Printer.
- Morgan, D. L. (2007). Paradigms lost and pragmatism regained: Methodological implications of combining qualitative and quantitative methods. *Journal of Mixed Methods Research*, 1(1), 48-76.

- Mtebe, J. S., & Raphael, C. (2019). Key success factors in implementing ICT in education: A case of Tanzania. *International Journal of Education and Development using Information and Communication Technology*, 15(2), 86-103.
- Mugenda, O. M., & Mugenda, A. G. (2003). *Research methods, quantitative and qualitative approaches*. Acts Press.
- Muigai, M., & Mantz, L. (2019). Leveraging technology in education: Insights from Kenyan classrooms. *Educational Technology Journal*, 23(4), 67-82.
- Muinde, S. M., & Mbataru, P. (2019). Determinants of implementation of public sector projects in Kenya: A case of the laptop project in public primary schools in Kangundo sub-County, Machakos County. *International Academic Journal of Law and Society*, 1(2), 328-352.
- Muirithi, P., Horner, D., & Pemberton, L. (2016). Factors contributing to adoption and use of information and communication technologies within research collaborations in Kenya. *Information Technology for Development*, 22(sup1), 84-100. <https://doi.org/10.1080/02681102.2015.1121856>
- Mukhwana, A. (2020). *ICT in Education: Strategies for Effective Implementation*. Nairobi: Jomo Kenyatta Foundation.
- Mulenga, IM and Kabombwe, MY (2019). *Understanding a competency-based curriculum and education: The Zambian perspective*. *Journal of Lexicography and Terminology*, 3(1):106-134.
- Munavu (2023). *Presidential Working Party on Education Reform. Transforming Education, Training and Research for Sustainable Development in Kenya* (pp. 17-35). Government printer.
- Munavu, S. (2023). *Presidential Working Party on Education Reform: Transforming Education, Training, and Research for Sustainable Development in Kenya*. Nairobi: Government Printer.
- Munyua, H. (2017). *Assessment of the Digital Age: Tools and Techniques*. Nairobi: East African Educational Publishers.
- Murithi, J., Yoo, J.E. (2021). Teachers' use of ICT in implementing the competency-based curriculum in Kenyan public primary schools. *Innov Educ* 3, 5: <https://doi.org/10.1186/s42862-021-00012-0>
- Mwangi, J. (2020). *ICT in Teaching under CBC: Opportunities and Challenges*. *Educational Technology & Society*, 23(2), 105-117.
- Mwaura, P. (2012). The relevance of pragmatism in contemporary educational research. *Journal of Education and Practice*, 3(6), 78-84.

- Najdabbasi, N., & Pedaste, M. (2014). Integration of technology into classrooms: Role of knowledge and teacher beliefs. In *HCI International 2014-Posters' Extended Abstracts: International Conference, HCI International 2014, Heraklion, Crete, Greece, June 22-27, 2014. Proceedings, Part II* 16 (pp. 117-122). Springer International Publishing.
- Ngure, M. W., & Wanjohi, G. (2024). *Teacher capacity and ICT integration under the CBC framework in Kenya: A rural perspective*. *African Journal of Education and Technology*, 6(1), 33–48.
- Njagi, J., & Wanjohi, M. (2020). *Creating and Curating Digital Content for Education*. Nairobi: Longhorn Publishers.
- Njagi, J., & Wanjohi, M. (2020). *Creating and curating digital content for education*. Nairobi: Longhorn Publishers.
- Njogu, L. (2021). *Teacher Experiences with Competence-Based Curriculum in Language Teaching*. *Educational Studies*, 27(3), 89-103. Nairobi: Kenya Literature Bureau.
- Nsengimana, T., Rugema Mugabo, L., Hiroaki, O., & Nkundabakura, P. (2020). Reflection on science competence-based curriculum implementation in Sub-Saharan African countries. *International Journal of Science Education, Part B*, 1-14.
- Nyongesa, W. J., & Westhuizen, J. V. D. (2025). *The impact of digital teaching tools on student engagement and learning outcomes in higher education in Africa*. *International Journal of Innovative Research and Scientific Studies*, 8(4), 264–280. <https://doi.org/10.53894/ijirss.v8i4.7777>
- Ochieng, E. O., & Mumo, N. (2022). *Validity and reliability of research instruments in educational studies: A Kenyan perspective*. *Journal of African Educational Research*, 14(1), 12–19.
- Ochieng, P. (2018). *Ethical Considerations in Digital Education*. Nairobi: Moran Publishers.
- OECD (2020). Digital strategies in education - Exploring education policies on digital technologies: [https://one.oecd.org/document/EDU/EDPC/SR/RD\(2020\)2/En/pdf](https://one.oecd.org/document/EDU/EDPC/SR/RD(2020)2/En/pdf)
- OECD (2021). *21st-Century Readers: Developing Literacy Skills in a Digital World*, PISA, OECD Publishing, Paris: <https://doi.org/10.1787/a83d84cb-en>.
- OECD (2023). *Shaping Digital Education: Enabling Factors for Quality, Equity and Efficiency*, OECD Publishing, Paris: <https://doi.org/10.1787/bac4dc9f-en>.
- Oluoch, D. (2019). *Integrating Technology in the Classroom: Best Practices*. Nairobi: Phoenix Publishers.
- Oluoch, G. (2019). *Challenges Faced by Teachers in the Implementation of Competence-Based Curriculum*. *International Journal of Education and Development*, 4(1), 23-34.

- Omondi, P. (2021). *Teachers' Preparedness and ICT Integration in the CBC*. International Journal of Educational Innovation, 5(1), 43-58.
- Pallant, J. (2020). *SPSS survival manual: A step by step guide to data analysis using IBM SPSS* (7th ed.). McGraw-Hill Education.
- Pan, A. C., & Carroll, S. Z. (2002, December). Preservice teachers explore instructional software with children. In *The Educational Forum* (Vol. 66, No. 4, pp. 371-379). Taylor & Francis Group.
- Parviaz, S., & Mufti, O. (2016). Pragmatism as the philosophical foundation for a mixed methods research design: A critical assessment. *International Journal of Social Research Methodology*, 19(1), 1-14.
- Patton, M. Q. (1999). Enhancing the quality and credibility of qualitative analysis. *Health Services Research*, 34(5 Pt 2), 1189-1208.
- Pelgrum, W. J. (2001). Obstacles to the integration of ICT in education: Results from a worldwide educational assessment. *Computers & Education*, 37(2), 163-178.
- Pelgrum, W. J. (2001). Obstacles to the integration of ICT in education: Results from a worldwide educational assessment. *Computers & Education*, 37(2), 163-178. [https://doi.org/10.1016/S0360-1315\(01\)00045-8](https://doi.org/10.1016/S0360-1315(01)00045-8)
- Phulpoto, I. A., Alrajhi, M., Arbab, A. Y., & Irfan, M. (2024). Evaluation of teacher training in the integration of ICT in teaching public secondary schools in Tigania West, Meru County, Kenya. *International Journal of Research and Innovation in Social Science*, 8(7), 45–60.
- Redecker, C. (2018). European framework for the digital competence of educators: DigCompEdu. *Publications Office of the European Union*.
- Republic of Kenya, (2019). *Policy framework for reforming education and training for sustainable development in Kenya*. Nairobi: Government Printer. <http://www.knqa.go.ke/wp-content/uploads/2019/03/Session-Paper-No-1-of-2019.pdf>.
- Republic of Rwanda (2015). Competence-based curriculum: Summary of curriculum framework pre-primary to upper-secondary. Government printer.
- Resnik, J. (2009). Multicultural education—good for business but not for the state? The IB curriculum and global capitalism. *British Journal of Educational Studies*, 57(3), 217-244.
- Richardson, J. W. (2011). Challenges of adopting the use of technology in less developed countries: The case of Cambodia. *Comparative Education Review*, 55(1), 008-029. <https://doi.org/10.1086/656430>
- Rosen, Y. (2009). The effects of an animation-based online learning environment on transfer of knowledge and on motivation for science and technology learning. *Journal of Educational Computing Research*, 40(4), 451-467.

- Shikomera, M. B., Mulwa, J. K., & Mwanja, J. M. (2023). The influence of availability of internet connectivity on teachers' integration of information communication technology in teaching and learning in public primary schools in Kenya. *International Journal of Research and Innovation in Social Science*, 7(8), 1473–1480.
- Stols, G., Ferreira, R., Van der Merwe, A., De Villiers, C., Venter, S., Pelser, A., & Olivier, W. A. (2015). Perceptions and needs of South African Mathematics teachers concerning their use of technology for instruction. *South African Journal of Education*, 35(4), 1-13. <https://doi.org/10.15700/saje.v35n4a1209>
- Strayer, J. F. (2012). How learning in an inverted classroom influences cooperation, innovation and task orientation. *Learning Environments Research*, 15(2), 171-193.
- Taylor & Francis Knowledge Center. (2020). *Cronbach's alpha – Knowledge and References*. In Taylor & Francis. Retrieved from Taylor & Francis knowledge database.
- Teachers Service Commission. (2022). *Teacher professional development framework*. Nairobi: Government Press.
- Tondeur, J., van Braak, J., & Valcke, M. (2007). Curricula and the use of ICT in education: Two worlds apart? *British Journal of Educational Technology*, 38(6), 962-976.
- Tondeur, J., van Braak, J., Ertmer, P. A., & Ottenbreit-Leftwich, A. (2017). Understanding the relationship between teachers' pedagogical beliefs and technology use in education: A systematic review of qualitative evidence. *Educational Technology Research and Development*, 65(3), 555-575.
- Tondeur, J., van Braak, J., Ertmer, P. A., & Ottenbreit-Leftwich, A. (2017). Understanding the relationship between teachers' pedagogical beliefs and technology use in education: A systematic review of qualitative evidence. *Educational Technology Research and Development*, 65(3), 555-575.
- UNESCO. (2021). *Digital learning for all: Gender equality and teacher training*. Paris: UNESCO.
- UNESCO. (2023). *Digital learning and transformation in African classrooms: Opportunities and challenges*. United Nations Educational, Scientific and Cultural Organization. <https://unesdoc.unesco.org/ark:/48223/pf0000382017>
- Usun, S. (2009). Information and communications technologies (ICT) in teacher education (ITE) programs in the world and Turkey: A comparative review. *Procedia-Social and Behavioral Sciences*, 1(1), 331-334. <https://doi.org/10.1016/j.sbspro.2009.01.062>

- von der Embse, N., Ronconi, M., Pendergast, L. L., & Gasiewski, J. (2021). A mixed-methods approach to investigating social and emotional learning at schools: Teachers' familiarity, beliefs, training, and perceived school culture. *Frontiers in Psychology*, 12, Article 518634. <https://doi.org/10.3389/fpsyg.2021.518634>
- Voogt, J., & Knezek, G. (2018). Technology integration in education: What works and why. *Educational Technology Research and Development*, 66(3), 521-541.
- Wachira, M. (2019). *Competence-Based Curriculum and Teaching: A New Era*. Journal of Modern Education, 12(3), 67-81.
- Wangui, J. K. (2023). An investigation on how lower primary school teachers is developing learners' digital literacy competencies: A case study of a primary school in Mtwapa, Kilifi County, Kenya. *Unpublished manuscript*.
- Wanyama, B. W. (2022). Physical facilities on students' participation in science and technology programmes in public universities in Kenya. *International Research Journal of Science, Technology, Education, and Management*, 2(1), 217-231.
- Wanyama, J., & Mbugua, T. (2021). *Collaborative Learning in a Digital Environment*.
- Yusuf, M. O., & Onasanya, S. A. (2004). Information and communication technology (ICT) and teaching in tertiary institutions. *Teaching in Tertiary Institutions*, 4(2), 67-76.
- Zhang, J., Zhao, J., & Tan, S. (2021). ICT integration in education: Insights from teacher experiences in China. *Journal of Educational Technology Development and Exchange*, 13(1), 1-17.

APPENDICES

Appendix I: Letter of Introduction

Obadiah Orangi,

Moi University,

P.O. BOX 3900-30100,

Eldoret.

Dear _____,

RE: REQUEST FOR PARTICIPATION IN A RESEARCH STUDY

You are invited to participate in a research study titled “**ICT Integration in Teaching in the Competency-Based Curriculum in Rural Public Junior Secondary Schools in Nyamache Sub-County, Kisii County, Kenya.**” This study is being conducted by **Obadiah Orangi** from the Department of Educational Management and Policy Studies at Moi University. The purpose of this study is to explore teacher experiences, the availability of ICT resources, and the professional development needs that affect the integration of ICT in teaching under the Competency-Based Curriculum (CBC). The findings aim to provide practical recommendations to enhance ICT integration in Junior Secondary Schools and contribute to the overall improvement of digital literacy in Kenya.

In this study, you will be asked to complete a written questionnaire or engage in oral interviews. Your participation in this study is voluntary, and you are free to withdraw at any time. The questionnaires and interviews should take 30 to 60 minutes to complete. This study has been approved by the Institutional Review Board of Moi University. There are no known risks associated with participating, and all responses will be recorded anonymously. Although you may not experience any direct benefits

from participation, the data collected could benefit the education sector by improving ICT integration and digital literacy in line with the CBC.

If you have any questions regarding this research project, please contact Obadiah Orangi at +254 719158007 or via email at obedorangi@gmail.com. Alternatively, you can reach my supervisor, Prof. Ann Kisilu, at +254 721267611 or email her at annekisilu73@gmail.com. For questions regarding your rights as a research participant, please contact the Institutional Review Board (IRB) at Moi University at +254 790940508.

Once you agree to participate in this study, a consent form will be provided for you to confirm your involvement with full information on the study. Your participation is appreciated.

Sincerely,

Obadiah Orangi,

Appendix II: Moi University Research Authorisation



MOI UNIVERSITY
Office of the Dean School of Education

Tel. Eldoret (053) 43001-8/43620
Fax No. (053) 43047

P.O. Box 3900
Eldoret, Kenya

REF: MSR/6504/24

DATE: 7th January, 2025

THE EXECUTIVE SECRETARY

National Council for Science and Technology
Box 30623-00100
NAIROBI

Dear Sir/Madam,

**RE: RESEARCH PERMIT IN RESPECT OF OBADIAH
ORANGI NYAKWARA – MSR/6504/24**

The above named is a 2nd year Master of Education Student at Moi University, School of Education, Department of Educational Management & Policy Studies.

It is required of his M.Ed studies to conduct a research project and produce a research report. His research topic is entitled:

**" ICT Integration in The Teaching of English Language Within
The Competence-Based Curriculum in Public Junior Schools, Nyamache,
Kenya."**

Any assistance given to enable him conduct research successfully will be highly appreciated.

Yours faithfully,

For: Anne

PROF. ANNE. S. KISILU
DEAN, SCHOOL OF EDUCATION



[ISO 9001:2015 Certified Institution]

Appendix III: Informed Consent

Investigator:

My name is **Obadiah Orangi**, and I am a postgraduate student at **Moi University, Main Campus**. I am inviting you to participate in a research study. Participation in the survey is voluntary, and you may choose to participate or not. I will explain the details of the survey to help you make an informed decision. Please feel free to ask any questions about the research, and I will gladly provide any necessary clarifications.

The study aims to explore the **integration of ICT in teaching in the Competency-Based Curriculum (CBC) in Rural Public Junior Secondary Schools in Nyamache Sub-County, Kisii County, Kenya**. You will be asked to provide your views and contributions in a one-on-one interview or by completing a written questionnaire.

Participant:

"All of my questions and concerns regarding this study have been addressed. I choose, voluntarily, to participate in this research project."

Name of Participant:

Signature of Participant:

_____ **Date:** _____

Name of Investigator:

Signature of Investigator:

_____ **Date:** _____

Appendix IV: Questionnaires for Grades 7, 8, & 9 Junior Secondary Schools Teachers

Questionnaire for Teachers on ICT Integration in Teaching

ICT integration in teaching aims to achieve the CBC's core competency in digital literacy by focusing on acquiring 21st-century skills, which are essential for making learners more relevant in the job market. Your responses will provide valuable insights into the integration of ICT in teaching in the CBC framework in Rural Public Junior Secondary Schools (JS).

Section A: Demographic Information

Category	Age	Gender	Years of JS experience	Academic qualification
	☐ Under 25-	☐ Male	☐ Less than 1 year	☐ Masters
	☐ 25-34	☐ Female	☐ 1 year	☐ -Degree
	☐ 35-44		☐ 2 years	☐ Diploma
	☐ 45-54		3 years	

Objective 1: Teaching Methods in ICT Integration

- How often do you use ICT tools (e.g. computers, tablets, educational software) in your teaching?**
 - ☐ Never - ☐ Rarely - ☐ Sometimes - ☐ Often - ☐ Always
- Rate your agreement with the following statement: 'I feel confident in integrating ICT into my teaching.'**
 - ☐ Strongly disagree - ☐ Disagree - ☐ Neutral - ☐ Agree - ☐ Strongly agree

3. How frequently do you use the following ICT-integrated teaching methods in your classroom?

Key

1=Never, 2= Rarely, 3=Sometimes, 4= Often, 5 =Very often

Tick in the relevant boxes

Method	1	2	3	4	5
<i>blended learning</i>					
<i>flipped classroom</i>					
<i>gamification</i>					
<i>collaborative learning</i>					
<i>simulation-based learning</i>					

Objective 2: Competencies Needed for Effective ICT Integration

4. Rate your current competency level in the following areas related to ICT integration:

Competency	Level				
Technical skills	☐ Very Poor	☐ Poor	☐ Average	☐ Good	☐ Excellent
Pedagogical knowledge	☐ Very Poor	☐ Poor	☐ Average	☐ Good	☐ Excellent
Designing digital content	☐ Very Poor	☐ Poor	☐ Average	☐ Good	☐ Excellent

Assessment strategies	☐ Very Poor ☐ Poor	☐ Average	☐ Good	☐ Excellent
------------------------------	--	----------------------------------	-------------------------------	------------------------------------

Objective 3: ICT Infrastructure Availability

7. Rate your agreement with the following statement: 'My school provides adequate ICT resources for effective teaching.'

- ☐ Strongly disagree - ☐ Disagree - ☐ Neutral - ☐ Agree - ☐ Strongly agree

8. To what extent are the following ICT resources available in your school for teaching?

ICT resource	Extent of availability		
Computers	☐ Not available -	☐ Limited	☐ Adequate
Tablets	☐ Not available -	☐ Limited	☐ Adequate
Internet access	☐ Not available -	☐ Limited	☐ Adequate
Interactive whiteboards	☐ Not available -	☐ Limited	☐ Adequate

Appendix V: Interview Questions for Junior Secondary Schools Heads of Institutions

Interview Guide for Heads of Institutions: ICT Integration in Junior Secondary

Schools

Thank you for agreeing to participate in this interview. This discussion aims to explore the current state of ICT infrastructure, the extent of ICT integration in your school, and the support provided to teachers for effective ICT use in education. Your insights will help us understand how schools are adapting to technological changes and how ICT impacts teaching and learning.

The interview will take approximately 40-60 minutes. With your permission, I would like to record our conversation to ensure that I accurately capture your responses.

Section A: School Overview

1. Can you briefly describe your school?

- Location (urban/rural)
- Type (public/private)
- Number of students and teaching staff

Section B: ICT Infrastructure

2. What ICT facilities are currently available in your school?

- Computer labs, laptops, tablets, projectors, etc.
- Internet access (e.g., Wi-Fi, broadband)
- Other relevant equipment

3. How would you describe the adequacy of these ICT resources?

- Are they sufficient for both teachers and students?
- What are the key challenges related to ICT availability?

4. What improvements would you like to see regarding ICT infrastructure in your school?

- Budgetary needs
- Additional facilities

Section C: ICT Integration in Teaching

5. How is ICT currently integrated into the teaching and learning process in your school?

- Can you provide specific examples of how teachers use ICT in their lessons?
- How often are digital tools (e.g., computers, projectors) used in lessons?

6. Do students regularly use ICT as part of their learning activities?

- What digital resources are available for student use?

7. In your opinion, how has ICT integration impacted the quality of education in your school?

- Benefits for students and teachers
- Areas where integration has been less effective

Section D: Teacher Competency and Support

8. How would you assess the level of ICT competency among your teaching staff?

- Do teachers feel confident using technology in the classroom?
- Are there gaps in ICT skills that need to be addressed?

9. What training or professional development opportunities are provided to teachers on ICT integration?

- Are there regular workshops, courses, or in-house training sessions?

10. What kind of technical or administrative support do teachers receive when using ICT in the classroom?

- On-site support, external assistance, peer mentoring

11. What challenges do your teachers face when integrating ICT into their lessons?

- Infrastructure limitations, technical issues, time constraints, etc.

Section E: Challenges and Future Plans

12. What are the biggest challenges your school faces in integrating ICT into teaching and learning?

- Financial limitations, equipment shortages, training needs, etc.

13. What plans do your school have to enhance ICT use in education?

- Are there any ongoing or upcoming initiatives to improve ICT infrastructure or training?

14. What recommendations would you make to other schools or educational bodies regarding ICT integration?

- Best practices
- Lessons learned

Conclusion

15. Is there anything else you would like to add about ICT integration or support in your school that we haven't covered?

Closing

Thank you for your time and valuable insights. Your input will be crucial in understanding the broader picture of ICT integration in Junior Secondary Schools and will help inform future research and educational policies.

Appendix VI: NACOSTI Permit Research License

 REPUBLIC OF KENYA Ref No: 154341	 NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION Date of Issue: 22/January/2025
RESEARCH LICENSE	
	
This is to Certify that Mr. Obadiah Nyakwara Orangi of Moi University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Kisii on the topic: ICT INTEGRATION IN THE TEACHING OF ENGLISH LANGUAGE WITHIN THE COMPETENCE-BASED CURRICULUM IN PUBLIC JUNIOR SCHOOLS, NYAMACHE, KENYA. for the period ending : 22/January/2026.	
License No: NACOSTI/P/25/415335	
Applicant Identification Number 154341	Director General NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION
Verification QR Code 	
NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.	
See overleaf for conditions	

Appendix VII: Sub-County Director of Education Permit

MINISTRY OF EDUCATION

STATE DEPARTMENT FOR BASIC EDUCATION



SUB COUNTY EDUCATION OFFICE

NYAMACHE,
P.O. Box 8-40203
NYAMACHE

E-mail Address: scdenyamache@gmail.com
When replying please quote
Phone no. 0723261811

DATE: 22/01/2024

THE JSS PRINCIPALS
NYAMACHE SUB-COUNTY.

RE: RESEARCH AUTHORIZATION: MR OBADIAH ORANGI NYAKWARA RE: MSR/6504/24

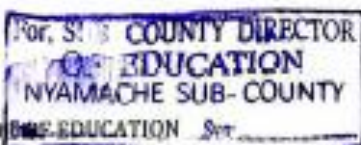
The above-named person has been given permission by the ministry of education to conduct research on **"ICT INTEGRATION IN THE TEACHING OF ENGLISH LANGUAGE WITHIN THE COMPETENCY-BASED CURRICULUM IN PUBLIC JUNIOR SCHOOLS, NYAMACHE, KENYA"**

The research will commence 23rd January 2025 and end on 31st JAN, 2025.

Any assistance accorded to him will be appreciated.

Wish you a successful research.


GANGRE JACKTONE
SUB-COUNTY DIRECTOR
NYAMACHE



Appendix VIII: Plagiarism Awareness certificate