EFFECT OF MOBILE LEARNING APPLICATIONS ON STUDENTS' ACADEMIC ACHIEVEMENT IN CHRISTIAN RELIGIOUS EDUCATION IN SECONDARY SCHOOLS IN KIAMBU COUNTY, KENYA

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A Thesis Submitted in Partial Fulfilment of the Requirements for the Degree of Master of Education of Murang'a University of Technology

August, 2026

DECLARATION

Student Declaration

I hereby declare that this Thesis is my original work and to the best of my knowledge has not been presented for a degree award in this or any other university. I understand what plagiarism is and I am aware of the university's policy in this regard. I understand that any false claim in respect of this work shall result in disciplinary action in accordance with the university Anti-plagiarism policy.

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Supervisors' Approval

The undersigned certify that they have read and hereby recommended for acceptance of Murang'a university of technology a thesis entitled "**Effect of Mobile Learning Applications on Students' Academic Achievement in Christian Religious Education in Secondary Schools in Kiambu County, Kenya"**.

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DEDICATION

I dedicate this work to my parents Mr. David Macharia and Mrs. Esther Macharia for their unwavering support, encouragement, and sacrifices that have been the foundation of my academic journey.

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First, I give all glory to the Almighty God for His grace, guidance and protection throughout my academic journey.

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ABSTRACT

Adoption of mobile learning applications in Education has transformed instructional practices. Studies done on mobile learning applications are from different localities and have targeted on Science, Technology, Engineering and Mathematics (STEM) learning areas, however, limited empirical data exists on its effect on student academic achievement in Christian Religious Education (C.R.E), particularly within Juja Sub-County. The objectives of the study are, to establish the effect of accessibility of mobile learning applications on students' academic achievement in C.R.E, to determine the effect of assessment features in mobile learning applications on students' academic achievement in C.R.E. in secondary schools, and to evaluate the effect of multimedia features in mobile learning applications on students' academic achievement in C.R.E. in secondary schools. The study used quasi experimental research design. The target population was two thousand one hundred and ninety form three students from thirteen senior schools in Juja Sub-County. The study adopted purposive sampling in selection of four senior schools. The sample size was three hundred and thirty-eight. Piloting was done in two schools; accessibility and proximity of the schools was considered in the selection of schools. Test-retest method was utilized, in ensuring reliability of the classroom observations. A Cronbach's Alpha Coefficient value of 0.7 was used as the cut-off point of the questionnaires and achievement tests. Statistical Package for Social Sciences (SPSS, Version 31) was utilized to analyze the quantitative data. The findings from the study established that accessibility of mobile learning applications have a positive effect on students' academic achievement with a mean of 4.05 and standard deviation of 0.834; the assessment features on mobile learning applications have effect on students' academic achievement with a mean of 4.09 and standard deviation 0.846 and multimedia features on mobile learning applications have effect on academic achievement of learners with a mean of 4.04 and standard deviation 0.857. The posttest mean difference between the experimental and control group was 3.55 demonstrating that use of mobile learning applications has effect on students' academic achievement in C.R.E. The study extends existing literature on effect of mobile learning applications on students' academic achievement in C.R.E., a learning area that has received limited scholarly attention. The study recommends that schools should adopt mobile learning applications in their instructional practices.

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ACRONYMS AND ABBREVIATIONS

CTML	Cognitive Theory of Multimedia Learning
PEOU	Perceived Ease of Use
KCSE	Kenya Certificate of Secondary Education
KICD	Kenya Institute of Curriculum Development
KNEC	Kenya National Examinations Council
STEM	Science, Technology, Engineering and Mathematics
NACOSTI	National Commission for Science Technology and Innovation
UNESCO	United Nations Educational, Scientific and Cultural Organization
SPSS	Statistical Package for Social Sciences
C.R.E.	Christian Religious Education
TAM	Technology Acceptance Model
C.B.E	Competency Based Education
ICT	Information Communication and Technology
PU	Perceived Usefulness
MOE	Ministry of education
SCDE	Sub-county Director of Education

DEFINITION OF TERMS

Mobile learning application - A digital environment or software whereby educational content is delivered using mobile devices.

Zeraki learning - A mobile learning application where educational content is delivered through mobile devices.

Academic achievement - Any success attained at the end an educational context.

Christian religious education - A learning area taught in Kenya school curriculum under the department of humanity.

Secondary school - An education level under the 8.4.4 Kenya curriculum, attended by children from about fourteen to eighteen years.

Cognitive theory of multimedia learning - A theory that argues that meaningful learning takes place when instructional material is presented through dual cognitive channels.

Technology acceptance model - A theory that posits that there are two major factors that determines the individuals' view and actions with regard to technology use.

CHAPTER ONE
INTRODUCTION

1.1 Background to the Study

Secondary education is crucial for personal development, shaping learners' intellectual, moral, and social development (Sharma, 2024). Secondary students are expected to deepen their understanding on various disciplines while preparing for higher education and responsible adulthood, which can be enhanced through continuous improvement of teaching methods (Boschetto &Warnick, 2024). Christian Religious Education is a key learning area in many formal education systems across the world (Gobbo,2023). Christian Religious Education (C.R.E.) equips students with the essential skill to distinguish between right and wrong and make ethical decisions in their daily lives (Kwabena, 2022). In Kenya, C.R.E. is considered a learning area that goes beyond the classroom settings to nurture disciplined, responsible, and morally upright citizens, making C.R.E. an important learning area for all education levels from elementary to higher education (Singoeia et al., 2025).

In recent years, the pedagogical approaches in teaching have evolved with increased integration of information communication and technologies (ICTs), emphasis on interactive and student-centered methods to enhance engagement and comprehension, resulting to improved learners' academic achievement (Tholibon et al., 2022). Use of mobile learning applications is one of the technology-based teaching approach that have being adopted to improve learners' grades in various learning areas (Eliza et al., 2024). Adoption of mobile learning has become one of the most significant changes in the worldwide pedagogy over the past few years, due to the increased ownership of smartphones and the growth of application-based instructional tools. The increase in affordable smartphones has motivated the use of mobile learning applications from the margins of educational innovation into mainstream pedagogical practice (Aziz, et al., 2021).

According to UNESCO (2023), mobile learning applications have been instrumental in reaching marginalized learners, especially in contexts where access to desktop computers and other traditional digital resources are limited. A case study done in Singapore by UNESCO (2023), considers the availability of digital tools as a policy priority rather than an incidental classroom resource, positioning digital technologies

like mobile learning applications as significant tools for promoting personalized, competency-based learning. Similarly, in Asia, mobile learning applications have been linked with increase in conceptual understanding in various learning areas due to the easy accessibility and usability of these applications credited with sustaining higher levels of learner interaction with content (Husnita et al., 2023). Sophonhiranrak, (2021) argue that mobile learning applications promote personalized learning, allow self-paced revision, widen access to multimedia and interactive content, and extend instruction beyond the school day.

In United States, schools have integrated mobile learning applications such as Canvas and Blackboard applications into mainstream teaching to promote learning (Chang & Farha, 2021). In Europe, countries like Finland and Germany, have emphasized mobile learning applications as part of their blended learning as way of promoting the learning outcomes (Eliza et al.,2024). However, the Swedish government has prohibited the use of mobile phones in the classroom in favour of printed textbooks and handwriting. Sweden's decision, is a reminder that the relationship between accessibility to mobile learning applications and learning outcomes is neither linear nor guaranteed as access to technology does not, by itself, translate into improved academic achievement and in some contexts unregulated device use has been associated with distraction and declining core competencies (Kessel et al., 2020).

A systematic review of factors influencing mobile learning success similarly identifies, that mobile learning strategies do, in aggregate, outperform conventional pedagogical approaches, but it simultaneously flags substantial heterogeneity in effect sizes, concluding that the benefit of mobile learning is highly scenario-dependent on factors such as electricity, broadband infrastructure, and institutional ICT support, accessibility of the platforms and reliable connectivity rather than a uniform and transferable outcome (Mehrfar et al., 2024).

The integration of digital technologies in education is significant for preparing learners for future employment, as education is an ever-evolving process. However, African learners are being left behind due to structural constrains like, limited access to ICT infrastructure, resulting in disparities in education (Odunga, 2024). The effect of mobile learning application is constantly limited by (Oubibi et al.,2024). Adoption of digital technologies in learning environment is seen as a way of addressing Sub-

Saharan Africa's dual challenge of quality and access in education, mobile-based solutions have been adopted as a means of addressing the continent's chronic shortfall in fixed infrastructure, given that mobile phones remain one of the primary channels through which African youth access and exchange information (Burns, 2020). Adoption of mobile learning is based in its accessibility, unlike computers, which are still unaffordable for many African families, mobile phones are less costly, enabling students to access a variety of educational content through mobile learning applications therefore establishing a personalize learning environment (Haleemet al.,2022).

In Ghana and Nigeria, mobile learning applications are increasingly used in higher education, with students using mobile devices as primary tools for accessing academic resources (Richter, 2023). Despite the many advantages, there are still a number of barriers that prevent the use of mobile learning applications from becoming a widely accepted educational model. A study done by Graves et al., (2021) found that even though all students have phones, they cannot afford to download online courses or stream instructional videos due to the high cost of internet connectivity and mobile data.

East Africa reflects the broader regional trend on adoption of digital technologies like mobile learning applications tempered by challenges related to infrastructure and pedagogical strain. The majority of existing mobile learning applications in East Africa are SMS based applications. SMS based applications are prominent feasible and low-cost method used to disseminate information in many east African countries (Jordan et al., 2025). In Tanzania, systematic reviews have reported that mobile learning applications are emerging as a feasible approach for improving access to learning materials at higher education level and addressing equity challenges like resource constraints (Qazi et al., 2024).

The forced pivot to online and mobile-based instruction during the COVID-19 pandemic exposed the fragility of digital learning systems across the globe, for instance a study of secondary schooling during the pandemic period, drawing partly on East African cases, characterizes the online learning experience as "challenge-ridden," citing teacher burnout, limited ICT resources, unreliable internet access, and consequent high learner dropout as dominant features rather than exceptions (Kisirkoi

& Kamanga, 2022). This account is useful precisely because it counters a narrative, common in policy discourse, that the pandemic accelerated a smooth digital transition in East African schooling; the empirical record instead shows uneven, resource-dependent adoption.

In Kenya, use of mobile learning applications like Zeraki learning has gathered momentum in the past few years. This has been driven by the widespread availability of mobile devices among young people and by government initiatives such as the Digital Literacy Programme (DLP), Kenya Education Cloud, and the Elimika teacher-training portal that have sought to embed digital and mobile-accessible content into basic education, particularly since the transition to the Competency-Based Curriculum (Mogaka, 2022). However high mobile phones penetration does not, by itself, establish that mobile learning applications are being meaningfully accessed for instructional purposes, it merely establishes that the technological precondition for such access exists. There is uneven adoption of ICTs like use of mobile learning applications across schools and regions (Kago, 2023). Under the Competency-Based Education (CBE) curriculum, the use of mobile learning applications as part of digital pedagogy plays a vital role in promoting learners' digital literacy (Nyamboki et al., 2025).

In Juja Sub-County, there is a notable growth on the adoption of mobile learning applications in teaching to support the CBE. However, in Juja Sub-County, C.R.E. records reveal slightly lower mean scores as compared to the national C.R.E. mean scores. The comparison of Juja Sub-County C.R.E. mean scores with national mean scores in KCSE is shown in Table 1.1

Table 1. 1: The comparison of Juja Sub-County C.R.E. mean scores with National C.R.E. mean scores in KCSE

Year	Juja sub-county mean score	National mean score
2020	5.90	6.05
2021	5.70	5.90
2022	5.83	6.00
2023	5.95	6.10
2024	5.75	6.02

Source: ***KNEC-KCSE REPORTS (2020-2024)***

Table 1.1 shows the comparison of Juja Sub-County C.R.E. mean scores with National C.R.E mean scores in KCSE from the year 2020 to 2024. The mean scores in C.R.E. in Juja Sub-County were slightly lower than the national C.R.E. mean scores in all the five years. This implies that students have been getting lower grades in C.R.E. as compared to national performance, hence need for an immediate intervention. According to Mubita and Mwanza, (2020) low scores in various learning areas is a result of the teachers' failure to embracing ICTs such as mobile learning applications that promote effective and efficient learning. The relatively low grades in C.R.E. in KCSE necessitated this study. Therefore, this study aimed at establishing the effect of mobile learning applications on students' academic achievement in C.R.E. in secondary schools in Juja Sub County, Kenya.

1.2 Statement of the Problem

Christian Religious Education (C.R.E.) is one of the learning areas in secondary schools examined by Kenya National Examination Council (KNEC) through Kenya Certificate of Secondary Education (KCSE). The KNEC annual reports on KCSE highlights a problem on mean scores in C.R.E. in Juja Sub-County over the past few years that are slightly lower compared to national C.R.E. mean scores. Concurrently, secondary school learners in Juja sub-county own and use smartphones at historically unprecedented rates, this scenario raises an unresolved question; can mobile learning applications have an effect on student academic achievement in C.R.E.?

Additionally, there exist numerous evidences that show, integration of mobile learning applications like Zeraki learning provide in teaching have positively influenced scores in STEM learning areas at secondary schools and tertiary education level, leaving behind scanty information on whether the persistence low grades in C.R.E. in

secondary schools in Juja Sub-County could be addressed by adoption of mobile learning applications in teaching C.R.E. among secondary school students. In addition, there are limited studies on mobile learning applications specifically Zeraki learning on students' academic achievement in C.R.E. in secondary schools in Juja Sub-County. This creates a gap that this study sought to address.

1.3 Research Objectives

1.3.1 General Objective

The purpose of the study was to establish the effect of mobile learning applications on students' academic achievement in Christian Religious Education in secondary schools in Juja Sub-County.

1.3.2 Specific Objectives

i. To establish the effect of accessibility of mobile learning applications on students' academic achievement in C.R.E. in secondary schools in Juja Sub-County.
ii. To determine the effect of assessment features in mobile learning applications on students' academic achievement in C.R.E. in secondary schools in Juja Sub-County.
iii. To evaluate the effect of multimedia features in mobile learning applications on students' academic achievement in C.R.E. in secondary schools in Juja Sub-County.

1.4 Research Hypothesis

H_{01}: Accessibility of mobile learning applications has no statistically significant effect on students' academic achievement in C.R.E. in secondary schools in Juja sub-County.

H_{02}: There is no statistically significant effect of assessment features in mobile learning applications on students' academic achievement in Christian Religious Education in secondary schools in Juja Sub-County.

H_{03}: Multimedia features in mobile learning applications have no statistically significant effect on students' academic achievement in C.R.E. in secondary schools in Juja Sub-County.

1.5 Significance of the Study

The study is necessary in advancing educational practice by demonstrating the effect of mobile learning applications on students' academic achievement in C.R.E. within

secondary schools in Juja Sub-County. The findings benefit various education stakeholders as follows:

By establishing the effect of mobile learning applications on students' academic achievement, the study may offer evidence that support C.R.E. teachers in adopting mobile learning applications in their teaching to enhance learner academic achievement. Moreover, the study might provide policymakers with data to inform policy directions on the integration of mobile learning applications into non-STEM learning areas.

Additionally, the study may contribute to educational research by filling a knowledge gap on effect mobile learning applications on students' academic achievement in Christian religious education, an area often overshadowed by STEM-focused studies. Finally, for the learners, mobile learning applications deliver learning content through different forms and every learner may be able to use his/her favorite form of learning that results to improved students' academic achievement.

1.6 Scope of the Study

The study was conducted in Juja Sub-county, Kiambu County, Kenya. The study was confined to thirteen public secondary schools within Juja Sub-county. Restricting the study to this geographical area enabled the researcher to effectively coordinate the implementation of the intervention, monitor data collection, and ensure consistency in the administration of research instruments across the participating schools (Kibiwott, 2025). Although the findings provide valuable insights into the effect of mobile learning applications on students' academic achievement, their generalization should be limited to schools with similar characteristics in terms of curriculum implementation, ICT infrastructure, and learner demographics. However, the findings provide insights that are transferable to similar educational settings in Kenya and beyond, given that mobile learning applications often share common pedagogical frameworks regardless of locale (Omariba, 2023). The study targeted Form Three students taking Christian Religious Education (C.R.E.) and in public secondary schools in Juja Sub-county, Kiambu County.

The study focused exclusively on public secondary schools and therefore excluded private secondary schools, primary schools, tertiary institutions and students not

enrolled in Christian Religious Education. This scope ensured that the study remained aligned with its objective of determining the effect of mobile learning applications on students' academic achievement in Christian Religious Education within the selected study area.

1.7 Limitations of the Study

The study faced several limitations that were considered in the interpreting the findings. The reliance on students self-reported data collected through questionnaires, could have been influenced by social desirability bias, exaggeration and under-reporting, leading to inaccuracies in the data. To reduce the potential for bias in self-reported data, the students were assured of confidentiality and anonymity and emphasized that the information provided would be used strictly for academic purposes, thereby encouraging honest and accurate responses. The researcher also triangulated questionnaire data with findings from classroom observations and students' achievement tests to enhance the validity and reliability of the findings.

Additionally, learner's digital competence and experience on the use of digital devices (smartphones and tablets) affected the consistency on use of the mobile learning application. Regarding variations in students' digital literacy levels, the students were provided with adequate orientation and practical guidance on how to access and use the Zeraki learning application before the intervention. In addition, the C.R.E. teachers provided technical support throughout the intervention to ensure that differences in digital literacy did not affect students' participation and learning outcomes.

1.8 Delimitations of the Study

This study was delimited to the effect of mobile learning applications (accessibility, assessment and multimedia features) on students' academic achievement in C.R.E. This construct was chosen due to its direct relevance to modern digital pedagogy in secondary school education, where ICTs integration has become a key driver to effective teaching and learning.

1.9 Contributions of the Thesis

This thesis extends existing literature on effect of mobile learning applications on students' academic achievement in C.R.E. in secondary schools by using Zeraki

learning within the context of Christian Religious Education, a learning area that has received limited scholarly attention, compared with STEM related learning areas.

The thesis provides empirical evidence on effect of specific features of mobile learning applications; accessibility, assessment features, and multimedia features, on students' academic achievement in Christian Religious Education.

1.10 Organization of the Thesis

The thesis is organized into five chapters;

Chapter One: Introduction, presents the background to the study, the statement of the problem, purpose of the study, research objectives, research hypotheses, significance of the study, scope of the study, limitations of the study, delimitations of the study and contributions of the thesis.

Chapter Two: Literature Review. The chapter reviews literature according to the three study objectives, focusing on the accessibility, assessment features, and multimedia features of mobile learning applications. It also discusses the theoretical and conceptual framework. The chapter concludes by identifying the research gap that the present study sought to address.

Chapter Three: Research Methodology. It presents the research approach and design, study location, target population, sampling procedures and sample size, research instruments, pilot study, validity and reliability of the instruments, data collection procedures, data analysis techniques, ethical considerations and a summary of the research methodology.

Chapter Four: Results and Discussion. It presents the response rate and demographic characteristics of the respondents, the findings according to the three research objectives and the summary of the findings.

Chapter Five: Conclusions and Recommendations. It presents conclusions drawn from the findings and provides recommendations. It also highlights the suggests future work.

CHAPTER TWO
REVIEW OF RELATED LITERATURE

2.1 Introduction

This chapter focuses on literature reviewed on the effect of mobile learning applications on students' academic achievement in Christian Religious Education. The literature was organized into empirical literature and concludes by identifying gaps in the existing literature that this study seeks to address.

2.2 Empirical Literature

This framework establishes the effect of accessibility, assessment features and multimedia features on mobile learning applications on student academic achievement.

2.2.1 Accessibility of Mobile Learning Applications on Students' Academic Achievement

The proliferation of mobile devices over the past two decades has fundamentally reshaped how instructional content is delivered and consumed in classrooms around the world. Mobile learning broadly defined as teaching and learning mediated through portable devices such as smartphones and tablets has moved from a peripheral innovation to a mainstream pedagogical tool (Naveed et al., 2023). Central to its promised benefits is accessibility: the ease with which learners can obtain, navigate, and meaningfully use mobile applications for academic purposes. Accessibility is not simply about owning a device; it is shaped by infrastructural, socioeconomic, and pedagogical variables that differ substantially across regions (Alam & Forhad, 2023).

Globally, empirical work has generally found a positive association between accessibility of mobile learning tools and improved academic outcomes, although the strength of that relationship is mediated by usability, content quality, and learner engagement. In higher education contexts, systematic reviews have catalogued a wide array of factors, including perceived usefulness, ease of use, accessibility, trust, price, and habit, that determine whether mobile learning applications translate into measurable academic gains (Naveed et al., 2023). A related global synthesis comparing mobile learning applications uptake across five continents found considerable variation in adoption maturity, with Asia and parts of Europe

demonstrating more integrated infrastructure and policy support than other regions (Eliza et al., 2024).

Beyond general achievement, mobile learning applications have been linked to gains in specific skill domains. For instance, mobile-assisted language learning research has documented improvements in listening and vocabulary acquisition attributable to gamified and interactive app features (Hamid et al., 2024; Khan et al., 2024). Systematic reviews of use of mobile learning applications during the COVID-19 pandemic further demonstrated that accessibility became a decisive factor in maintaining continuity of instruction, with reviewers noting both a surge in adoption and a parallel widening of disparities between learners with reliable connectivity and those without (Qazi et al., 2024; Rahiem, 2020). Reviews focused on critical thinking and learning outcomes similarly report that mobile learning applications, when accessible and well-designed, can enhance higher-order cognitive engagement, though effect sizes vary considerably by discipline and instructional design (Pedraja-Rejas et al., 2024). However, technology integration succeeds only where it is embedded within a coherent pedagogical and equity framework (UNESCO, 2023).

Use of mobile learning applications to support learning has become a common part of the global educational landscape (Naveed et al., 2023). However, this broad observation warrants closer scrutiny, as accessibility is not a uniform condition as it is shaped by infrastructural, socioeconomic, and pedagogical variables that differ substantially across regions (Alam & Forhad, 2023). The ease access to mobile devices and usability of mobile learning applications, offers a room for increased students' interaction with quality learning content, thus supporting better comprehension of content (Husnita et al., 2023). According to research done in China the accessibility of mobile learning applications leads to deeper comprehension of content, but accessibility is not a uniform condition as it is shaped by infrastructural, socioeconomic, and pedagogical variables that differ substantially from one region to another. (Min, 2024). Findings reflected from a developed country contexts with relatively robust digital infrastructure and should not be uncritically transposed to sub-Saharan African settings where connectivity, device ownership, and electricity access remain inconsistent (Dagal, 2026).

Research in religious education demonstrated that mobile learning applications can make learning more flexible and accessible. Basyiroh et al., (2024) examined Android-based mobile learning application as a medium for Islamic Religious Education among students. The study reported that mobile learning application was considered effective and attracted students' interest in Islamic Education leading to improved academic achievement. However, the study also identified internet connectivity as one of the challenges affecting implementation mobile learning applications, as students may have smartphones but still be unable to access digital lessons consistently where internet connectivity is unreliable.

Within Africa, the relationship between mobile learning applications accessibility and academic achievement is shaped by a distinct set of structural realities, including uneven electrification, variable internet penetration, and disparities between urban and rural school systems. A systematic review of digital media use in African higher education found that, while mobile devices are often the primary and sometimes only gateway to digital learning resources for students, infrastructural constraints substantially limit the depth and consistency of that access (Loglo & Zawacki-Richter, 2023). Complementary work on e-learning implementation in Ethiopian and Rwandan universities identifies recurring challenges: inadequate bandwidth, high data costs, insufficient digital literacy among both students and instructors, and inconsistent institutional policy support (Abera et al., 2025). These infrastructural barriers are compounded by broader structural issues; recent scholarship on Africa's energy divide underscores that unreliable electrification remains a foundational constraint on any technology-mediated learning strategy across much of the continent (Dagal, 2026).

At the secondary level, a review of South African mobile learning applications Chaka (2022) highlighted that students who find it easy to use the mobile learning applications demonstrated stronger conceptual grasp, especially when teachers incorporated mobile learning applications-based activities into classroom instruction. This finding is notable because it foregrounds the role of teacher mediation suggesting that accessibility alone is insufficient without corresponding pedagogical support (Khan et al., 2024).

In Nigeria, ulesson is the most widely mobile learning application. A study done by Okoye, (2024) on ulesson mobile learning application and students' interest in C.R.E.,

highlights that flexibility and accessibility of mobile learning application are key factors in enhancing the learning experience for students. By adapting to the individual's learning pace and style, ulesson addresses the specific weaknesses of students, thus enhancing their overall learning outcomes, thus, mobile learning application is significant tool for boosting students' academic achievement in C.R.E in secondary schools. Green and Carter (2023) highlight the importance of accessibility in mobile learning, noting that mobile learning applications have significantly increased students' engagement with religious content outside the classroom, leading to better comprehension, retention of information and overall improved learning outcomes.

In East Africa specifically, a study evaluating a mobile educational tool in Tanzanian higher education highlighted that usability and user experience not merely device ownership were decisive in determining whether students and teachers found the tool pedagogically valuable, reinforcing that accessibility must be understood as a multidimensional construct encompassing affordability, connectivity, digital literacy, and interface design (Mwandosya, Montero, & Mbise, 2022). Despite the vital relationship between technology access and improved learning outcomes, many studies have oversimplified the relationship between technology access and learning outcomes, without considering structural barriers such as unreliable internet and inadequate teacher training that can undermine the very accessibility, they promote (Hasim and Bakar, 2025).

In Kenya, studies done on mobile learning applications have begun to draw attention on mobile learning applications potential to improve student learning outcomes. Integration of mobile learning applications such as Zeraki learning have gained traction as an accessible mobile learning application in secondary schools, due to its great compatibility with affordable android devices representing a deliberate design response to Kenya's infrastructural limitations (Muhammedova et al., 2025). A study done by Muchena (2025), revealed that students who use accessible digital teaching learning resources including mobile learning applications like Zeraki learning, have improved academic achievement compared to those using conventional methods. National-level analysis of Kenya's digital literacy initiatives found that ICT integration, including mobile-enabled resources, was positively associated with

academic performance, but that implementation gaps, particularly teacher preparedness and device access in rural schools constrained the initiative's full potential (Mogaka, 2022).

A parallel study examining digital learning across Kenyan secondary schools reached a similar conclusion, identifying opportunities in flexible, self-paced access to content alongside persistent gaps in teacher training, curriculum alignment, and school-level connectivity infrastructure (Mogaka, 2022). Research on competency-based education implementation in Homa Bay County further found that ICT integration, including mobile-based resources, supported the delivery of the competency-based curriculum, though schools varied widely in the extent to which they could operationalize this support due to resource constraints (Nyamboki, Areba, & Oranga, 2025).

Studies specifically situated in Kiambu County reinforce this pattern of promise tempered by implementation gaps. Research on ICT's influence on teaching and learning outcomes in Kenya Certificate of Secondary Education (KCSE) performance in Kiambu County public secondary schools found a measurable relationship between ICT resource use inclusive of mobile learning applications and improved academic outcomes, while also flagging resource disparities between schools as a limiting factor (Kago, 2023). Complementary Kiambu-based research on teaching-learning resource utilization in neighboring Murang'a County similarly found that resource accessibility, including digital tools, was closely tied to subject-specific performance outcomes, echoing findings that access alone is insufficient without adequate pedagogical support (Muchena, 2025).

The review of literature revealed a gap on current studies on the effect of accessibility of mobile learning applications like Zeraki learning on students' academic achievement in C.R.E. at secondary school level in Juja Sub-County, majority of the studies done were on global and regional levels with limited empirical data on local levels, especially in Juja Sub-County.

2.2.2 Assessment Features in Mobile Learning Applications on Students' Academic Achievement

The increased availability of smartphones and wireless connectivity has positioned mobile learning from a peripheral instructional aid to a mainstream feature of formal

education (Okai-Ugbaje et al.,2022). The acceleration to this change is the growing sophistication of assessment features embedded in mobile learning applications, quizzes, tests, instant feedback, progress-tracking dashboards, and gamified scoring. These features are theorized to influence academic achievement by increasing the frequency, immediacy, and personalization of feedback learners receive (Hakim et al., 2025).

Mobile learning applications is conventionally traced as a lineage from distance learning through electronic learning to mobile learning with assessment functionality evolving in step with device capability. Early mobile learning applications relied on basic cellular phones, where assessment was limited to simple drill-and-practice quizzes constrained by small screens and unreliable connectivity (Jordan et al., 2025). As smartphones matured, assessment features expanded to include auto-graded multiple-choice testing, rubric-based evaluation of submitted work, and achievement scales. In the last decade, formative assessment had become a defined design goal in its own right; formative-assessment-based on mobile learning application exemplifies a shift from purely summative testing toward continuous, in-the-moment checks for understanding (Carney et al., 2022).

Globally, mobile learning applications have gained momentum as powerful tools for boosting content retention among students (Naveed et al., 2023). In Australia, James et al., (2024), argued that learners using the mobile learning applications with assessment features showed significantly higher retention of information than those who relied only on textbooks or teacher led instruction. However, generalization of these findings to African educational contexts must be critically questioned as the Australian setting is characterized by high levels of access to digital technologies in school, conditions that differ materially from those prevailing in many Kenyan secondary schools (Fraillon, 2020). Similarly, in United States, Finland, and Indonesia, assessment features on mobile learning applications have been seen to enhance content retention in learners through offering real-time feedback, self-assessment, and repetitive practice (Eliza et al., 2024). However, it is unclear from the study whether the improved outcomes are attributable primarily to the immediacy of feedback or the frequency of practice (Gini et al., 2025).

A study on mobile learning in Islamic Religious Education examined the use of mobile learning applications as an educational medium in response to the increasingly common use of smartphones among students. The study highlights the potential of assessment features on mobile learning applications to provide a more engaging learning environment in religious education resulting to improved academic achievement (Ahmad et al., 2025). However, this study is situated within Islamic Religious Education, therefore the findings cannot be transferred directly to CRE without considering differences in curriculum and learning content.

Mobile learning applications assessment features to deliver frequent, low-stakes, immediate feedback that supports continuous rather than episodic evaluation, with systematic reviews associating gamified, interactive assessment elements with increased motivation, participation, and overall academic achievement (Paudel & Shrestha, 2025). Mobile learning applications supporting self-assessment have also improved academic outcomes in professional training contexts, evidencing cross-disciplinary opportunity. However, although assessment and feedback are central to both student learning and satisfaction, mobile learning applications assessment feedback remains comparatively under-theorized and lacks a cohesive, unified framework to guide large-scale implementation (Bikanga, 2023). The corresponding global challenge is design quality: cautions that poorly sequenced mobile tasks combining physical and digital contexts can increase cognitive load and depress rather than enhance achievement (Le Cunff et al., 2024).

A study found favorable effects of a mobile learning applications on both academic achievement and attitudes, while mobile learning applications formative quizzes have been linked to improved academic achievement and satisfaction, particularly where feedback is immediate (Tiantian et al., 2024). A study on higher education report that assessment features on mobile learning applications reshape study habits with downstream effects on grades and retention, and found that mobile learning applications supporting self-assessment and objective performance evaluation improved the students' academic achievement., however: on study found that assessment features on mobile learning applications with tasks poorly matched to learners' cognitive capacity could depress rather than enhance achievement, establishing design quality, clarity, pacing, and feedback timeliness as the moderating

variable between the use assessment features in mobile learning applications and academic achievement (Canoy & Pedraza, 2025).

In Africa, the evolution of assessment features on mobile learning applications has followed a distinct trajectory shaped by infrastructural constraint rather than device sophistication. The earliest and most durable African innovations in assessments in mobile learning applications were built around SMS rather than data-intensive applications (Jordan et al., 2025). In the past few years, vast ownership of mobile devices even among the disadvantaged students have promoted the wide adoption of mobile learning applications. Mobile learning applications assessment features are associated with increased engagement, participation, and collaborative learning, which the literature treats as proximal drivers of academic achievement even where direct achievement measures are not always reported (Gabriel, 2025).

The African higher-education systematic review found that assessments in mobile learning applications increased student–lecturer collaboration, participation, engagement, and improved academic achievement (Kaliisa et al., 2022). A study done by Okoye (2024), revealed that often incorporate assessment features such as quizzes and immediate feedback in the mobile learning applications results to improved academic achievement as it makes the learning experience more engaging and personalized compared to traditional classroom settings.

According to Mohammadi et al., (2020) students who use mobile learning applications with quizzes and tests for learning are able to learn and revise well, which improve their scores on assignments and tests showing great improvement in content retention. In Tanzania students that use mobile learning applications to access assignments, quizzes, and learning resources are reported to be able to apply academic concepts beyond the classroom, (Mgeni et al., 2024). Instructors highlighted that learners using mobile learning applications quizzes demonstrated higher content retention than other non-users (World bank report, 2024). However, other mechanisms driving to these retention gains is unclear whether improvements stem from the gamified assessments (Gini et al., 2025). Mobile leaning applications assessment can reach learners who would otherwise be excluded from digital education entirely, and is argued to offer cheap and reliable affordances that support less-privileged learners typically bypassed by newer technologies. The offsetting challenge is cost and infrastructure; the cost of

internet connectivity and mobile data remains a major barrier, since many students who own, phones cannot afford to download online courses or stream educational restricting which assessment features are viable in practice (Nirmani, 2025).

Offline-capable mobile learning applications research has identified limited device storage capacity, occasional data-synchronization errors, and teachers' lack of technical know-how as factors undermining full adoption, while a further structural challenge is recognition: certifications obtained through mobile learning platforms are not always validated by ministries of education, weakening incentives for sustained engagement with mobile learning applications assessment despite its reach advantages(Umar & Argungu, 2025). Where infrastructural and cost barriers are addressed, as in offline-capable low-connectivity solutions, pedagogical effectiveness has been demonstrated alongside strong academic achievement.

Kenya's evolutionary path is among the most documented on the continent. Different mobile learning applications have been launched in partnership with Safaricom delivering round-the-clock access to curriculum-aligned lessons, quizzes, revision papers; an evolution from feature-phone SMS quizzes to a national-scale assessment service (Antoninis et al., 2023). Mobile learning application like M-Shule extended the SMS-based evolutionary branch, delivering interactive, self-paced micro-courses and using SMS-based assessments and quizzes to measure learner progress across thirteen counties in multiple local languages. A parallel, smartphone-based evolutionary branch subsequently emerged with platforms such as Zeraki learning, which moved beyond text-based quizzes toward allowing students to take quizzes and track performance across fifteen KICD-approved subjects, adding real-time dashboards and teacher-facing tools for tracking assignment and note engagement (Jordan et al., 2025). This represents the maturation of Kenyan mobile learning applications assessment from simple SMS testing toward integrated, curriculum-aligned, dashboard-driven ecosystems.

The Competency-Based education emphasis on continuous formative assessment aligns naturally with mobile learning application affordances such as those offered by Zeraki learning, whose quiz features allow learners to identify strengths and weaknesses in specific subjects and topics, focusing revision on areas needing improvement. Mobile learning applications with assessment features have shown a

promise in boosting content retention across different learning areas. Learners using mobile learning applications like Zeraki learning with assessment features have demonstrated great retention of knowledge through personalized quizzes and bite- size content to reduce cognitive load (Muraguri,2024). Students highlight that repetition and immediate feedback have helped in reinforcing retention of content weeks after instruction (Muchena, 2025). However, students' academic achievement can be influenced by variables such as teacher support or students' baseline digital literacy (Chen, 2025).

Zeraki Learning's design diagnostic quizzes that identify strengths and weaknesses by topic combined with real-time progress dashboards operationalizes precisely the mechanism through which mobile assessment is theorized to raise achievement: regular testing, clear diagnostic feedback, and visible progress tracking that sustains revision behaviors. The corresponding Kenyan challenges on mobile learning application-based assessments are largely governance-related rather than purely technical; mobile phone possession is frequently restricted or informally banned in classrooms, complicating deployment of mobile learning application assessment even where learners already own capable devices; digital literacy gaps among both teachers and students persist (Stanley & Odoyo, 2021).

The review of literature revealed a gap on current studies on effect of assessment features on mobile learning applications like Zeraki learning on students' academic achievement in C.R.E. at Secondary School level in Juja Sub-County, majority of the studies done were on global and regional levels with limited empirical data on local levels, especially in Juja Sub-County.

2.2.3 Multimedia Features in Mobile Learning Applications on Students' Academic Achievement

Multimedia features video, animation, audio narration, graphics, and interactive simulations delivered through mobile learning applications have become central to how mobile learning application is designed and experienced. Unlike text-only, multimedia-enabled mobile learning applications combine words and pictures, exploit dual sensory channels, and allow learners to control pace and sequence, which are levers for deeper understanding and, ultimately, academic achievement (Hossain, 2023). As mobile devices matured from simple text-and-call handsets into

multimedia-capable smartphones, the multimedia principles migrated from desktop e-learning and printed instructional material into mobile learning applications themselves, first as embedded images and short audio clips, then as full video lessons, narrated animations, and interactive simulations (Uzunboylu & Azhar, 2023).

Systematic reviews of mobile learning applications note the progressive incorporation of gamified multimedia elements such as educational games and simulations increase academic achievement. The integration of multimedia features like audio, video, and animations within mobile learning applications has attracted considerable scholarly attention due to their potential to enhance knowledge transfer and academic achievement (Generalao, 2025). Mobile learning applications that deliver learning content through audios and videos, help learners to transfer knowledge into life situations, showing great academic achievement (Lee, 2023). Mobile learning applications provide students with visual and audio content, allowing them to engage more deeply with abstract concepts (Hamid et al., 2024). However, it is unclear whether multimedia format itself or the curriculum relevance and quality of the content delivered through that format, drives the observed improvements in academic achievement.

In Europe and Asia, students especially those in engineering and medicine who have adopted use of mobile learning applications have shown higher grasp of academic concepts (Rangel-de Lazaro & Duart, 2023; Kim & Kwon, 2021). Mobile learning applications have been seen to increase learning satisfaction and self-efficacy among learners, which in turn boosts learners' academic achievement (Rangel-de Lazaro & Duart, 2023; Kim & Kwon, 2021). Furthermore, students who watch animations on the mobile learning applications have demonstrated great ability in the application of academic concepts practically in different life situations, (UNESCO, 2023).

A study done by Basyiroh et al., (2024) provided evidence on the potential of mobile learning application-based learning media to improve learning outcomes in Islamic Religious Education. The positive evaluation from the experts and students indicated that mobile learning application-based learning media is suitable for use as a learning medium, while the reported improvement in students' learning outcomes demonstrated the potential of mobile learning application -based learning media to support academic achievement. However, these gains are documented in a highly resourced educational

system where multimedia content is well-resourced, professionally produced, and closely aligned to curriculum expectations conditions that cannot be assumed to be replicable in low-resource African settings.

The corresponding global challenge is cognitive overload; presenting the exact same information redundantly across narration and on-screen text can confuse learners and reduce comprehension rather than aid it resulting to low academic achievement. Multimedia features on mobile learning applications benefit learners with good sustained attentional control, while learners with poorer attentional abilities performed worse (Liu, 2024). This establishes a persistent global tension: multimedia features on mobile learning applications are not inherently beneficial and must be carefully matched to learner characteristics and instructional objectives, or it risks overwhelming rather than enhancing their academic achievement.

In Africa, the evolution of multimedia features in mobile learning applications has followed the continent's broader digital-adoption curve, arriving later and adapting to infrastructural constraint. Early educational technology efforts in African classrooms centered on printed materials and, where available, static computer-based instruction; multimedia elements such as animation and video became feasible only as smartphone ownership expanded and as teachers began pre-loading video content directly onto personal devices to circumvent unreliable connectivity (Oko, 2025). This offline evolutionary branch, in which multimedia on mobile learning application is downloaded once and reused rather than streamed continuously, has become a defining feature of how multimedia features in mobile learning applications has developed across much of the continent, alongside the growing use of animation and simulation-based instruction in science subjects as a response to chronic shortages of physical laboratory equipment.

In the past few years, multimedia features in mobile learning applications have been highly used to foster academic achievement of the learners and applied learning. In south Africa, students who utilize videos on mobile learning applications have been seen to be able to think critically in their daily life showing great academic achievement, (Mutambara & Bayaga, 2020). In Tanzania students that utilize multimedia features on mobile learning applications are reported to be able to retain abstract content for a longer duration (Mgeni et al., 2024). Similarly, a study done by

Okoye (2024), highlighted that mobile learning applications with elements such as audios and videos, make the learning more engaging compared to traditional classroom settings, this increased engagement can turn learning into a more enjoyable activity, thereby increasing students' interest in C.R.E. that eventually results to improved academic achievement.

The corresponding challenge to full utilization of multimedia features on mobile learning application is infrastructural; limited access to educational technology, including unreliable electricity supplies, constrains sustained use of video-based instruction in many African classrooms, forcing teachers toward preloaded, offline multimedia rather than streamed content. Device storage limitations compound this challenge, since video and animation files are substantially larger than text or SMS-based content, straining the storage capacity of the entry-level smartphones common among African learners and teachers (Mwinyi, 2024).

Kenya's evolution mirrors this broader African pattern while showing signs of moving into a more sophisticated, multimedia features on mobile learning applications phase. Early Kenyan mobile learning applications, exemplified by SMS-based platforms, was necessarily text-driven because of feature-phone limitations (Jordan et al., 2025). As smartphone penetration rose, multimedia elements were layered onto these text-first foundations: Zeraki Learning represents this evolutionary shift most clearly, offering a video-based digital learning platform allowing high school students to watch video lessons, across fifteen KICD-approved subjects, including Christian Religious Education, prepared by experienced Kenyan teachers. A study done in Makueni County highlights that animated visuals moved from a novelty supplement to a deliberate pedagogical strategy for elevating engagement and critical thinking, particularly in subjects where practical demonstration is otherwise constrained by resources (Muinde et al.,2023).

This local evolution from text-only SMS content to video-based, KICD-aligned, curriculum-integrated multimedia platforms represents a compressed version of the decades-long global trajectory from static text to interactive multimedia, achieved within roughly a single decade in the Kenyan secondary school context. Mobile learning platforms such as Zeraki learning incorporate multimedia elements including syllabus-aligned video lessons, animated concept explanations, and practical

illustrative examples. Jordan et al., (2023) found that Kenyan students engaging with videos and ethical case studies through mobile learning applications like Zeraki learning demonstrated higher academic achievement and stronger knowledge application in real-life situations. However, it is unclear on whether the improved gains broadly to attached to multimedia engagement without examining which specific elements whether the visual presentation, the ethical framing of content and the curriculum alignment of videos.

The corresponding Kenyan challenge facing maximum utilization of multimedia features on mobile learning applications mirrors the continental pattern but is compounded by data costs: multimedia content, being data-intensive, is disproportionately expensive to stream relative to text-based SMS learning, meaning that the same cost barriers that constrain broader mobile learning applications adoption in Kenya apply with particular force to multimedia-rich features, potentially limiting their reach to better-resourced learners even within the same school (Kiamati, 2026). The review of literature revealed a gap on current studies on effect of multimedia features on mobile learning applications like Zeraki learning on students' academic achievement in C.R.E. at secondary school level in Juja Sub-County, majority of the studies done were on global and regional levels with limited empirical data on local levels, especially in Juja Sub-County.

2.3 Theoretical Framework

This study was anchored on two theories; the Cognitive Theory of Multimedia Learning (CTML) developed by Richard E. Mayer in 2001 and Technology Acceptance Model (TAM) theory developed by Davis in 1989. Together, they explain the study outcomes.

2.3.1 Cognitive Theory of Multimedia Learning (CTML)

The Cognitive Theory of Multimedia Learning (CTML), posits that learners understand and retain information more effectively when it is presented through multiple channels, such as text, audio, and visuals, rather than through a single medium (Trypke et al., 2023). CTML is grounded in three assumptions; the dual-channel assumption that include separate channels for visual and auditory processing, the limited capacity assumption where each channel has finite capacity,

and the active processing assumption where learning occurs when learners engage in selecting, organizing, and integrating information (Trypke et al., 2023).

Mobile learning applications integration is a crucial innovation in teaching, as they deliver content through texts, images, graphics and videos, providing learners with a variety of learning experiences to cater for individual learning style thus helping students understand content better and retain it longer (Pedraja-Rejas et al., 2024). This dual coding helps students retain and comprehend complex information more effectively, (Mir, Fatima and Fatima, 2024).

Mobile learning applications apply cognitive load principles such as the coherence principle, highlighting essential information and breaking content into manageable parts, this significantly lower cognitive load and promote effective learning (Toh, & Tasir, 2024). Through features like interactive quizzes, reflective prompts, and digital flashcards, mobile learning applications embrace interactive learning, these features help the students to go beyond surface-level memorization and engage with the material on a deeper level (Troussas et al., 2022).

2.3.2 Technology Acceptance Model (TAM)

Technology Acceptance Model (TAM), explains how users come to accept and use technology. The According to TAM, two primary factors; perceived usefulness (PU) and perceived ease of use (PEOU). Perceived usefulness (PU); the level to which a user believes that adopting a specific new technology would enhance his/her task performance level (Lee et al., 2025). Perceived ease of use (PEOU); the degree to which a user believes that adopting a specific new technology would require less or no effort to performance task (Rizkalla et al., 2024).

This theory guided the outcomes of the perceived ease of use and perceived usefulness of mobile learning applications among students. Accessibility of mobile learning applications affect the students perceived ease of use. Assessment features such as quizzes, feedback, and progress tracking affect perceived usefulness of mobile learning applications, as learners recognize that these applications help them to improve their grades, they inclined to integrate them into their study, (Lee et al., 2025).

2.4 Conceptual Framework

A conceptual framework is a visual representation that illustrates how independent variables, dependent variables and intervening variables are interconnected (Salawu et al., 2023). Conceptual framework helps in comprehension of research problem and directs researcher (DeMarco 2020). The study adopted the conceptual framework as shown in Figure 2.1

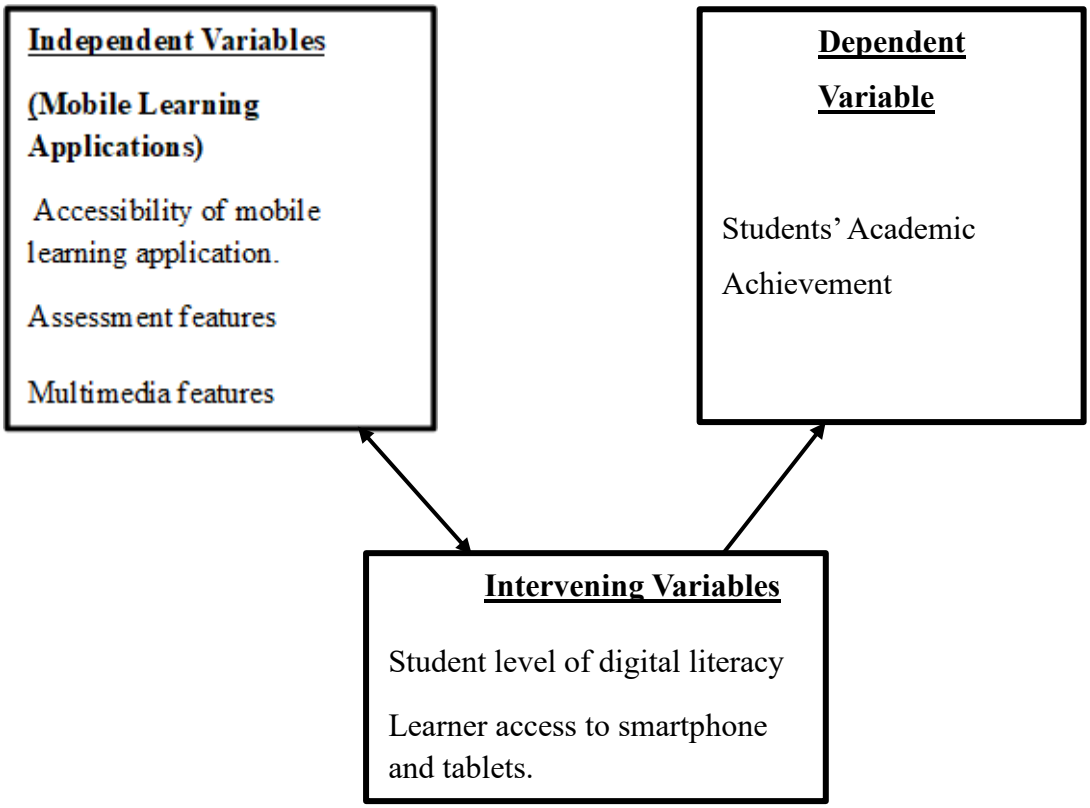


Figure 2.1: Conceptual Framework

Source: Constructed by the researcher (2026)

Structure of conceptual framework Figure 2.1 outlines the correlation between independent variable, dependent variable and intervening variables. Mobile learning application (Zeraki learning) was the independent variable, with accessibility, assessment features, and multimedia features as its indicators. Accessibility refers to the ease in use mobile learning applications and the ability to accommodate a wide range of learners with diverse levels of abilities related to, learning and cognitive abilities (Husnita et al., 2023). Assessment features on mobile learning applications involve quizzes, feedback, and progress tracking that help students gain an idea of the

assessment process while providing them with feedback on how to refine their efforts for improvement (Ismail et al., 2022).

Multimedia features on mobile learning applications encompass combination of multiple cognitive channels like, text, audio, video, and interactive graphics, which enhance comprehension and retention of content (Staneviciene & Žekienė, 2025). These features on mobile learning applications are expected to directly influence how students learn using mobile learning applications. Students' academic achievement was the dependent variable. Academic achievement refers successful acquisition of knowledge by students at a particular education level that help them in contemporary society outcome (Al-Abyadh, et al., 2022).

In this study academic achievement referred to the knowledge the students acquired after being taught C.R.E. using Zeraki learning. Students` academic achievement was measured through achievement test that is, pretest and posttest. The relationship between mobile learning application (Zeraki learning) and academic achievement was further shaped by intervening variables, that include, students' level of digital literacy and access to smartphone and tablets. Digital literacy refers to the degree at which one can effectively understand and operate digital technologies appropriately (Bashar and Naaz, 2024). Students' digital literacy influenced how they effectively navigated Zeraki learning and utilized assessment tools. Prior to the commencement of the study, all students participating in the experimental group underwent a comprehensive orientation program designed to familiarize them with the mobile learning application. This orientation ensured that every participant acquired the minimum digital skills required to use the application effectively, regardless of their previous experience with mobile learning application.

The study controlled this intervening variable by ensuring that students in the experimental group received a common orientation on how to use the Zeraki learning. Learner access to smartphones and tablets, determined the extent to which the students engaged with Zeraki learning individually without sharing during C.R.E. lessons. The study controlled this intervening variable by ensuring students were given similar opportunities to access and use the application during the intervention, with comparable learning conditions and access time provided to minimize differences arising from device availability.

2.5 Chapter Summary

A research gap is an unexplored or insufficiently studied area within a field of study that requires further investigation (Muhammad, 2025). Identifying and addressing these gaps ensures that the new research enhances scholarly understanding and provides practical solutions to existing challenges (Muhammad, 2025).

Accessibility of mobile learning applications have long been acknowledged for its capacity to enhance conceptual understanding, promote student engagement and improve academic achievement (Mwandosya et al., 2022; Muchena, 2025; Husnita et al., 2023; Min, 2024). Despite these benefits, there is a limited number of empirical studies on the effect of accessibility of mobile learning applications on academic achievement especially within the secondary school setting in Juja Sub-County. To fill this gap, this study provided evidence of the effect of accessibility of mobile learning applications on students' academic achievement in C.R.E. in secondary school in Juja Sub-County.

Assessment features on mobile learning applications have been associated with improved student engagement and knowledge retention resulting to improved academic achievement (James et al., 2024; Eliza et al., 2024). While assessment features on mobile learning applications have been extensively examined in various regions, there is a scarcity of research on their effect on students' academic achievement in C.R.E. in secondary schools at local level in Juja Sub-County. The effect of assessment features on mobile learning applications on students' academic achievement in C.R.E. in secondary school an area requiring empirical investigation. This study aimed at addressing this gap by establishing both qualitative and quantitative outcomes, providing a holistic understanding of the effect of assessment features on mobile learning applications on student academic achievement in C.R.E. in Juja Sub-County.

Multimedia features on mobile learning applications have emerged as an essential component of effective education. Multimedia features on mobile learning applications promotes critical thinking, problem-solving, active engagement in students and improved academic achievement ((Hamid et al., 2024; Rangel-de Lazaro & Duart, 2023; Kim & Kwon, 2021). However, while mobile learning applications have been recognized as applications for improving students' academic achievement,

there remains a significant contextual gap in understanding effects of multimedia features on mobile learning applications on students' achievement in C.R.E. in secondary schools within Juja Sub-County. This study sought to establish the effect mobile learning applications on students' academic achievement in C.R.E. in Juja Sub-County.

Overall, numerous studies done in different localities have demonstrated that integration of mobile learning applications in teaching various learning areas at diverse educational level have several benefits to the learner like active learner engagement, improved critical thinking, mastery of content and student academic achievement (Hamid, Putriwanti & Chrysty, 2024; James et al., 2024; Mwandosya et al., 2022). Despite these key benefits to the learners there are limited empirical studies on the effect of mobile learning applications like Zeraki learning on Students' academic achievement in C.R.E. in secondary schools at local level especially within Juja Sub-County. To fill this gap, this study provided evidence of the effect of mobile learning applications on students' academic achievement in C.R.E. secondary school in Juja Sub-County.

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction

The chapter focuses on elements of research methodology like, the research methods, research design, location of study, target population, sampling, and sample size, data collection, validity and reliability, piloting, data collection procedure, data analysis presentation and data analysis techniques and the ethical considerations.

3.2 Research Philosophy

This study is anchored in the pragmatism research philosophy, which provides a suitable foundation for the integration of both quantitative and qualitative research approaches. Pragmatism is grounded in the belief that the choice of research methods should be driven by the research problem rather than adherence to a single philosophical paradigm. It emphasizes practical solutions and the use of multiple methods to generate a comprehensive understanding of complex educational phenomena (Elgeddawy & Abouraia, 2024).

In the context of this study, pragmatism supports the use of quantitative data to measure students' academic achievement alongside qualitative data to capture learners' experiences with mobile learning applications in Christian Religious Education. This philosophical stance allows the researcher to draw on the strengths of both approaches to provide a more holistic interpretation of the effect of mobile learning applications on student outcomes (Creswell & Creswell, 2018; Saunders et al., 2019).

Furthermore, pragmatism acknowledges that reality is multifaceted and can be understood through both objective measurements and subjective experiences. It therefore encourages methodological pluralism and the triangulation of data sources to enhance the validity and reliability of research findings. By adopting this philosophy, the study is able to integrate statistical analysis with contextual insights, thereby offering a richer and more nuanced understanding of how accessibility, assessment features, and multimedia components of mobile learning applications influence students' academic achievement in Christian Religious Education (Kaushik & Walsh, 2019).

3.3 Research Method

A research method refers to the specific techniques, procedures, and strategies used to collect, analyze, and interpret data in order to answer research questions or test hypotheses (Khan at al., 2023). This study adopted a mixed methods strategy which utilizes both quantitative and qualitative research methodologies (Ahmed, Pereira, and Jane, 2024).

Combination of quantitative data from the academic achievement tests, close ended questionnaires and qualitative data from observation checklists and open-ended questionnaires provided deeper insights (Arias-valencia, 2022). Mixed method ensures triangulation of data, thereby enhancing validity and reliability while capturing both measurable outcomes and contextual experiences to provide a comprehensive understanding of complex phenomena (Ahmed et al., 2024).

3.4 Research Design

The research adopted a quasi-experimental research design, specifically non-equivalent groups pretest and posttest design (Capili and Anastasi 2024). A quasi-experimental design helps in establishing cause-and-effect relationship in naturally existing groups, making it suitable for educational settings where randomization may be impractical or ethically inappropriate (Kim & Clasing-Manquian, 2023).

Table 3.1: Experimental and Control Groups

Group	pretest	Intervention	Post test
Experimental Group	C_1	✓	C_3
Control Group	C_2	X	C_4

Where:

C_1 and C_2 is pre-test

C_3 and C_4 is post test

✓ is intervention administered

X is no intervention administered

Four secondary schools in Juja Sub-County were purposively selected, where two schools, that had access to tablets or smartphones formed the experimental group while the other two secondary school that did not have access to tablets or smartphone formed the control group. A pre-test was administered to the form three C.R.E. students in both experimental and control group to get baseline data on the students` knowledge in C.R.E.

Pretest help in ensuring that students involved in the study have similar ability before the beginning of the intervention (Majka, 2024). After the pretest the mobile learning application (Zeraki learning) was introduced to the students in the experiment group for a period of three weeks. After the exposure to the intervention for three weeks a posttest was administered to the students in both the control group and the experiment group to assesses the learning outcomes.

3.5 Locale of the Study

The study was carried out in Juja Sub-County, Kiambu County, that lies within central region in Kenya. According to Gitonga (2022), Juja Sub-County is metropolis with centralized urban regions bordered by rural areas, one of the factors that influenced its choice as the research site. Additionally, Juja Sub-County also records high mobile phone ownership among the youths and internet access (Bett, 2025). However, there is continuously low grades in C.R.E., this made it an ideal locale for establishing the effect of mobile learning on students' academic achievement in Christian Religious Education among secondary schools in Juja Sub-County.

Furthermore, research in education is not limited to a specific geographical location; comparable research can be carried out in a region and replicated elsewhere, provided that contextual variables are considered (Creswell & Creswell, 2021). This underscores the potential for generalization of the findings from this research to different sub-counties in Kenya and beyond, where mobile learning interventions are influenced by sampling techniques.

3.6 Target Population

Target population refers to every unit that a researcher is interested in studying and drawing conclusions about (Willie,2023). In this study, the target population consisted of two thousand one hundred and ninety (2,190) form three C.R.E. students, from thirteen secondary schools located in Juja Sub-County. These schools included, day and boarding schools. Form Three students were selected because they have adequate exposure to the C.R.E. curriculum which made them suitable for establishing the effect of mobile learning applications on students' academic achievement in C.R.E.

Table 2.2: Target Population Distribution

SCHOOL	NUMBER OF FORM 3 STUDENTS
AA	176
AB	159
AC	133
AD	146
AE	177
AF	172
AG	111
AH	121
AI	422
AJ	137
AK	129
AL	146
AM	161
Total	**2190**

Source: SCDE Juja (2026)

Further, the thirteen schools were classified into two groups; the experimental group and the control group.

Table 3.3: Distribution of Control and Experimental Schools

SCHOOL	Classification of the schools (experimental /control)
AA	Experimental
AB	Experimental
AC	control
AD	control
AE	Experimental
AF	Experimental
AG	Experimental
AH	control
AI	Experimental
AJ	Control
AK	control
AL	Experimental
AM	Control

Source: Constructed by the researcher. (2026)

Out of the thirteen secondary schools in Juja sub-county, six schools (control) had no access to smartphones or tablets while the seven schools(experimental) had access to smartphones and tablets.

3.7 Sampling

As described by Makwana et al., (2023) sampling is the process of picking a portion from the unit of interest to be involved in data collection for research. The subset usually acts as a representative of the targeted population under study (McEwan, 2020). In this research, sampling was described as the process of selecting the schools and students from the targeted population that participate as informants of the study.

3.7.1 Sampling Techniques

Sampling techniques involve strategies employed in picking a portion from unit of interest to participate in research (Ahmed et al., 2024). Purposive sampling technique and simple random sampling techniques were employed in this research.

3.7.2 Sampling procedure

According to Ahmed (2024) sampling procedure are steps followed when conducting a sampling to determine the sample size. Purposive sampling was used in selection of four secondary schools within Juja Sub-County. simple random sampling was used in selection of the students.

3.7.2.1. Purposive Sampling

In purposive sampling, individuals are chosen to be part of the sample in regard to their significance to study goals (Makwana et al., 2023). In this study, purposive sampling was employed in selection of the four secondary schools that participated in the study, where two secondary schools (school AE and AG) that possessed the required infrastructure for mobile learning applications such as smartphones or tablets formed experimental group, while the other two secondary schools (school AJ and AC) that that had no access to smartphones or tablets formed the control group.

3.7.2.2. Simple Random Sampling

As stated by Makwana et al., (2023) in this technique every unit of interest have an equal opportunity of being chosen to form a sample. In this study, all the students in the experimental schools were subjected to the tests and mobile learning application (Zeraki learning), however simple random sampling was used in selection of the students, where the extra student's tests and questionnaires were removed during the data analysis. Simple random sampling within the selected schools enhanced representativeness and reduces selection bias (Noor et al., 2022).

3.7.3 Sample Size

According to Hossan and Alhasnawi, (2023) sample size is the quantity of participants in research that represent the target population. The study consisted a total population of two thousand one hundred and ninety form three C.R.E. students from thirteen secondary schools in Juja Sub-County. The Form Three C.R.E. students sample size was determined using Yamane's formula. The formula is precise, valid and ensures proportional sampling and the sample is fair representation of total population (Oluigbo, 2024).

Yamane's formula:

If;

n = sample size

N = total population size

e = margin of error (0.05).

Then $n = N / (1 + N(e)^2)$,

$=2190/ (1+ 2190(0.05)^2)$

$=2190/ (1+ 2190(0.0025))$

$=2190/ (1+ 5.475)$

$=2190/ 6.475$

$=338.2239$

According to Lakens (2022) a sample size of between 10 % and 30% of the target population is recommendable for any study. In this study 338 students formed the study sample size leading to a percentage of 15.43 % of the target student population.

Table 3.4: Students sample size distribution

Group	**Students sample Size**	**Number of schools**	**Students Sample size per group**
Experimental group		2	169
AE	98		
AG	71		
Control group		2	169
AJ	86		
AC	83		
Total		4	338

3.8 Data Collection Instruments

The study employed three data collection instruments to strengthen validity through triangulation as combination of several data collection instruments assures the reliability, validity and generalizability of research conclusions, offsetting the weaknesses of any single data collection instruments (Bans-Akutey & Tiimub, 2021).

3.8.1 Achievement tests

As described by Loeser and John, (2023) achievement test is a standardized test or teacher-made assessment designed to measure the extent to which learners have mastered specific knowledge, skills or content in a given learning area. They Provide uniform measure of student achievement, quantifiable evidence of students' learning outcomes and enables comparison of students' academic achievement across different groups (Oyeronke & Adeoye, 2024).

In this study achievement test were distributed in two stages, administration of the pretest to both experimental and control groups and administration of the posttest immediately after use of Zeraki learning in teaching C.R.E. The tests were designed based on Form 3 C.R.E. syllabus.

3.8.2 Questionnaire

A questionnaire is a low-cost instrument of data collection with a sequence of queries designed to elicit responses from relatively large group research students within a short period (Ranganathan & Caduff, 2023). It encourages the students to give more honest answers as it offers greater anonymity among students (Koo &Yang, 2025).

In this study, questionnaires were administered to students in the experimental groups from the two purposively selected schools, to capture their thought on effect of mobile learning applications on their academic achievement in C.R.E. Clear instructions were provided to guide the students. Completed questionnaires were collected immediately after completion to maximize return rates ((Ranganathan & Caduff, 2023). To provide an opportunity for lengthy opinions the questionnaires consisted of closed-ended questions and open-ended questions (Semyonov-Tal & Lewin-Epstein, 2021).

The questionnaire had four sections; section A on Demographic information, section B effect of accessibility of mobile learning applications on students' academic achievement in C.R.E., section C on effect of assessment features on mobile learning applications on students' academic achievement in C.R.E. and section D on effect of multimedia features on mobile learning applications on students' academic achievement in C.R.E. (appendix 5).

3.8.3 Observation Checklist

According to Dimitra et al., (2024) observation checklist is a data collection instrument that helps in recording and gaining clear picture on presence, frequency, or absence of specific student behavior, practices or classroom dynamics. According to Kibiwott, (2025) observation helps in gathering information that students might be unwilling or unable to disclose through self-reported data collection instruments.

In this study observation checklists were completed during instructional sessions to document how Zeraki learning was integrated into C.R.E. lessons. The selected two C.R.E. lessons were attended and observed without interrupting the teaching process, where each lesson was observed using its own checklist filled independently, as it helped in capturing real-time evidence on classroom practices, that complements self-reported data from the students' questionnaires (Omariba, 2023).

The checklist was divided into three sections, section A on accessibility of mobile learning application, section B on assessment features on mobile learning application and section C on multimedia features on mobile learning application (Appendix 5). The data from the observation checklist was used to ensure triangulation of data, thereby enhancing a comprehensive understanding of complex phenomena (Ahmed et al., 2024).

3.9 Piloting

As described by Simkus (2023), piloting is a small-scale preliminary study that entails picking a few students and testing the research on them before conducted main research. It helps in identifying any uncertainty in the information provided to students and check practicality of data collection instruments.

The pilot study was conducted before the main study data collection and after the research instruments had been developed and approved for piloting**.** It was done in two schools; one control and one experimental, that were not part of the main research. Accessibility and proximity of the schools was considered in the selection of schools for piloting as it allowed efficient supervision and timely incorporation of feedback before commencing on major data collection (Golzar et al., 2022). The pilot test involved 40 Form Three C.R.E. students. The students were selected because they had characteristics similar to those of the target population. The pilot test involved administering the research instruments to form three C.R.E. students in these schools. Feedback from piloting was used in revising and refining data collection instruments before conducting the actual data collection (Renuse, 2024).

3.10 Validity and Reliability

Andersson et al., (2024) defines validity as a level whereby a research instrument evaluates parameters it supposed to evaluate while reliability refers to uniformity of a research data collection instrument producing similar results under similar conditions.

3.10.1 Validity

According to Andersson et al., (2024) a valid research instrument accurately captures the concept under investigation and ensures that the data collected truly reflects the concept being studied. In this research content validity and construct validity were adopted.

3.10.1.1 Content validity

Content validity is the degree whereby a data collection instrument effectively conceals all dimensions of concept or variables under study, without leaving out important aspects or including irrelevant ones (Roebianto et al.,2023). In this study the data collection instruments; achievement test, questionnaires and observation checklist, adequately covered and measured all the aspects that were supposed to be measured in this study, without leaving out any important aspect.

3.10.1.2 Construct Validity

Construct validity refers to level whereby a research instrument correctly evaluates the theoretical aspects it is meant to capture Heffernan (2024). In this study, construct validity was established to ensure that the data collection instruments; achievement

test, questionnaires and observation checklist, accurately measure the effect of mobile learning application on students' academic achievement C.R.E. among secondary school students. To achieve this, each item in the data collection instruments; achievement test, questionnaires and observation checklist were aligned with the variables of this study to ensure that they addressed all aspects of mobile learning applications and academic achievement. Pretest and posttest were solely designed from the approved Form Three C.R.E. curriculum to ensure reflection of intended curriculum outcomes.

3.10.2 Reliability

As stated by Andersson et al., (2024) reliable instrument yields the similar outcomes when administered in similar circumstances. In this study Test-retest Method and Cronbach alpha were adopted to determine the reliability of the data collection instruments.

3.10.2.1 Test–Retest Method of Reliability

Test-retest method entails giving identical research instrument to unchanged group of students on two distinct occasions, usually separated by an appropriate time interval (Anderson et al., 2024). The scores from the two administrations are then correlated to determine the stability of the instrument (Andersson et al., 2024). In test-retest method was utilized in this study where the classroom observation was done twice to the same group of the students after one week while ensuring that the initial conditions for the study were maintained.

3.10.2.2 Cronbach alpha

Cronbach alpha method was applied in this study to determine the internal consistency of the questionnaires and the achievement tests, as they contained multiple items (Adeniran, 2025). The alpha coefficient was measured on a scale ranging from zero to one (Adeniran, 2025). The nearer the Cronbach's alpha coefficient is to 1, the greater the internal consistency of the variables in the scale (Adeniran, 2025). Cronbach's alpha coefficient value above 0.7 is typically regarded as good (Adeniran, 2025). In this study, a Cronbach's Alpha Coefficient value of 0.7 was used as the cut-off point of the questionnaires and Achievement test, where all items whose reliability value was below 0.7 were adjusted and some excluded.

3.11 Data Collection Procedures

Before commencing data collection procedures, the following approval were sought; approval from Murang'a University of Technology Scientific and Ethics Research Committee, National Commission for Science, Technology and Innovation (NACOSTI), sub county director of education in Juja Sub-County and school principals from the selected schools. A pilot test of instruments was conducted in two school to establish reliability and validity (Kariga, 2025). The schools that participated in the pilot study did not take part in the main research.

The achievement tests were administered in two stages; administration of the pretest to both experimental and control groups and administration of the posttest immediately after the exposure to Zeraki learning. Scheduled appointments were made on visitation of each selected school separately for data collection using observation during classroom learning. As per the plan, questionnaires were distributed to the learners under the experimental group and requested to complete the questionnaire and return it immediately.

3.12 Data Analysis and Data Presentation Techniques

The data collected was in form of both quantitative and qualitative data. The Statistical Package for Social Sciences (SPSS, Version 31) was utilized in analysis of quantitative data from the Close ended questionnaires and achievement tests using both descriptive and inferential statistic.

Inferential statistics analysis was done through paired sample t-tests in comparison of pretest and posttest results within identical groups, independent sample t-tests was adopted in comparison of differences between the experimental and control groups. These t-tests are suitable for examining group mean differences in quasi-experimental research (Talikan et al., 2024). A one-way ANCOVA was used to analyze differences in post-test scores between the experimental and control group (Jung et al., 2025). Simple linear regression analysis was done to confirm the effect of assessment and multimedia features in mobile learning application on student academic achievement in C.R.E.

In analysis of descriptive statistics means and standard deviations, were employed to display the emerging trends (Alabi & Bukola, 2023). The quantitative data was

presented in form of pie chart and tables. Qualitative data from the open-ended questionnaires and observation checklists was thematically analyzed to establish the emerging themes. Thematic analysis allows for the systematic interpretation of participant experiences and perspectives (Braun & Clarke, 2021). The qualitative data was presented in form narrative presentations.

3.13 Ethical Considerations

Ethical considerations are the moral obligations of a researcher in ensuring the students` rights, dignity, and overall well-being are well protected (Ambang et al., 2021). In this study all the ethical standards were adhered to throughout the research process.

3.13.1 Ethical issue related research

Ethics in research deals with moral values that guide the researcher when conducting a study (Omariba, 2023). In this study, other people's work was acknowledged through proper citation of their work.

3.13.2 Ethical issue on research subjects

Being aware of the compliance with child safeguarding principles, strategies were put into place to guarantee that students were free from emotional, physical, or psychological harm and create a welcoming and secure environment where students are able to withdraw from the participation freely if need arise.

In this study all students were requested to fill in an assent form and for students under 18 years parental or guardian consent was required (Cotrim et al., 2021). During recruitment, the students were given essential information about the study, its purpose, participant role and potential risks, benefits, confidentiality, so as to make independent and informed choice about whether to participate (Arellano et al., 2023). Students were guaranteed of confidentiality of the responses they provided, right to withdraw at any stage without any penalty.

3.14 Chapter Summary

The study adopted a mixed-methods research approach using a quasi-experimental research design, specifically non-equivalent groups pretest and posttest design. The study targeted Form Three C.R.E students in thirteen secondary schools in Juja sub-

county. Four schools were purposively selected for the study, with two schools assigned to the experimental group and two to the control group. The experimental groups were exposed to learning through the Zeraki mobile learning application, while the control groups continued with conventional teaching methods.

Data were collected using achievement tests, questionnaires and classroom observation checklists. The achievement tests consisted of pre-tests and post-tests to assess students' academic achievement, while questionnaires were used to obtain students' perceptions regarding the accessibility, assessment features, and multimedia features of the mobile learning application. Classroom observations complemented the quantitative data by providing information on students' interaction with the application during learning.

The collected data was analyzed using both descriptive and inferential statistics. Descriptive statistics, including frequencies, means, and standard deviations, were used to summarize the data. Inferential statistics included paired-samples t-tests, independent-samples t-tests, one way ANOVA, and simple linear regression. The analysis was conducted using the Statistical Package for the Social Sciences (SPSS version 31). Qualitative observations were used to complement and explain the quantitative findings. A pilot study was conducted in two schools that were not included in the main study to establish the reliability and validity of the research instruments. Ethical considerations, including informed consent and assent, confidentiality, voluntary participation, and protection of participants from any form of harm, were observed throughout the study.

CHAPTER FOUR
RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the analysis, interpretation, and discussion of data collected through achievement tests, questionnaires, and observation checklists during the fieldwork stage of the study. The study generally aimed at establishing the effect of mobile learning applications on students' academic achievement in Christian Religious Education in secondary schools in Kiambu county, Kenya.

4.2 Research Instrument Return Rate

A response rate exceeding 68% is advisable in data analysis in ensuring representativeness, relevance, and sample quality in addressing the research objectives (Holtom et al., 2022). In this study, printed questionnaires were distributed in the two schools under experimental group where 154 learners responded and returned them leading to return rate of 91.13% as shown in table 4.1.

Table 4.1: Questionnaire return rate

School	Number of questionnaires issued	Returned questionnaires	Percentage
School AE	98	85	50.30%
School AG	71	69	40.83%
Total	**169**	**154**	**91.13%**

4.3 Demographic Characteristics of the Students

Further the demographic characteristics of the form three C.R.E. students are discussed in terms of the gender and age of students. The information was essential in contextualizing the findings across studies, as it highlights the diversity and representativeness of the sample (Call et al., 2023).

4.3.1 Gender Distribution of the students

The gender distribution of students was examined to ensure that both male and female students were adequately represented in the study. This is particularly important in educational research, as gender dynamics can influence learning experiences, motivation, and learning outcomes (Muhammad et al., 2025; Aguillon et al., 2020).

The sample included students from both genders, proportionately drawn from the Form Three C.R.E. population across the selected schools, to avoid gender bias and strengthen the validity of the findings (Upchurch, 2020).

Table 4.2: Demographic Characteristics of Students

Control group	**Gender**	**Selected No.**	**Percentage**
	Male	65	38.46
	Female	104	61.54
Total		**169**	**100.00**
Experimental group	**Gender**	**Selected No.**	**Percentage**
	Male	80	47.34
	Female	89	52.66
Total		**169**	**100.00**

4.3.2 Age of the Students

The study aimed to explore the age range of the students. The results indicated that 73.08% of the students were aged 15-16 years, while 21.00% were between 17 and 18 years, and 5.92% were aged above 19 years. This reveals that majority of Form Three students taking C.R.E. were aged between 15 and 16 years.

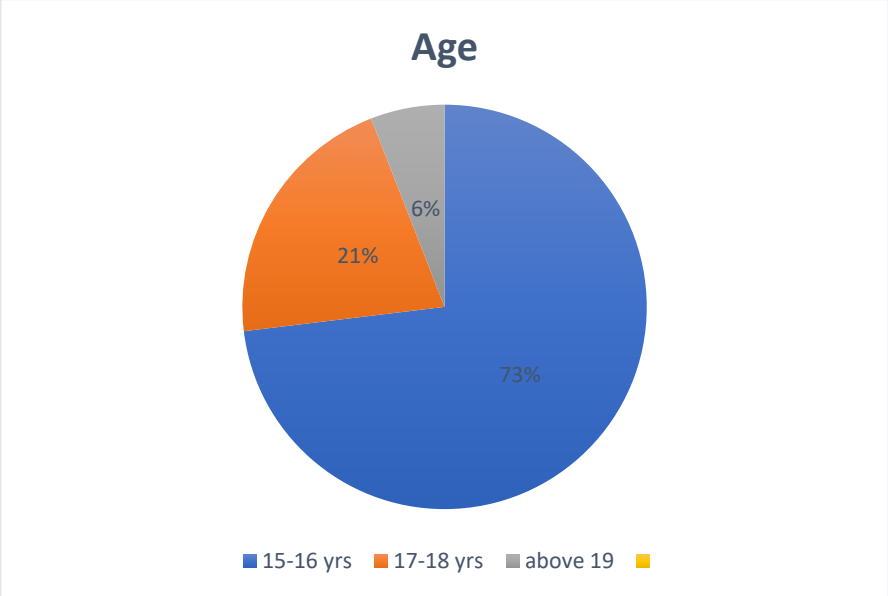


Figure 4.1: Age of the Students

4.4 Results

The findings are analyzed in accordance to the study objectives.

4.4.1 Accessibility of Mobile Learning Applications on Students' Academic Achievement in C.R.E.

The first objective of the study sought to establish the effect of accessibility of mobile learning application on students' academic achievement in Christian Religious Education. To achieve this objective, data was collected using student questionnaires, classroom observations and achievement test.

An item in the questionnaire sought students view on effect of accessibility of mobile learning applications on students' academic achievement in C.R.E. The questionnaire containing closed ended and open-ended questions were used to gather students view on effect of accessibility of mobile learning applications on students' academic achievement in C.R.E. The closed ended questionnaire was used to collect data based on a five-point Likert scale with a scale of 1 - Strongly Disagree (SD), 2 - Disagree (D), 3 – Neutral (N), 4 - Agree (A) and 5 - Strongly Agree (SA). This scaling technique allowed the quantification qualitative perceptions and convert them into numerical data that could be easily analyzed statistically (Mcleod, 2023). Students were asked to indicate their level of agreement from a value of 1-5 with several statements regarding accessibility of the Zeraki learning.

The responses from the open-ended questionnaire were thematically analyzed and narratively presented, while the responses from the closed ended questionnaire were analyzed using mean and standard deviation and the findings are summarized in Table 4.3.

Table 4.3: Students' views on effect of accessibility of mobile learning application on their academic achievement in C.R.E.

No.	Item	(SD) %	(D) %	(N) %	(A) %	(SA) %	Mean	Standard deviation
1.	I can easily log into Zeraki learning whenever I need to.	1.4	1.1	10.9	52.8	33.8	4.16	.769
2.	I have reliable internet access that allows me to use Zeraki learning regularly.	1.1	1.7	17.0	40.8	39.4	4.16	.842
3.	I can easily navigate lessons and learning materials on Zeraki learning.	1.4	3.6	21.2	45.5	28.2	3.96	.875
4.	Learning material on Zeraki learning is always available when I need it.	1.2	2.4	21.2	48.8	26.4	3.97	.820
5.	I can access learning materials on Zeraki learning without technical difficulties.	1.4	2.2	17.6	48.3	30.4	4.04	.834
6.	Zeraki learning loads quickly and works well on the device I use	1.1	2.5	21.9	42.7	31.8	4.02	.861
	Aggregated score						**4.05**	**.834**

The findings from Table 4.3 show that the students agreed on various items on the accessibility of Zeraki learning. The students approved that they were able to easily log in to the Zeraki learning whenever they needed, with a mean of 4.16, and a standard

deviation of 0.769. This finding concurs with a study by Palshkov et al., (2024) which posited that mobile learning applications are viewed accessible tool of education.

Further, responses from item two indicated that reliable internet access was important for consistent use of the mobile learning applications with a mean of 4.16 and a standard deviation 0.842. The study concluded that students value stable connectivity to internet in order to engage with learning materials without interruptions. Prior studies have shown that internet reliability is a critical factor in determining the effectiveness of mobile learning, as it allows students to access learning materials at any time (Mushtaq, 2025).

The students also agreed that learning materials on Zeraki learning could be easily navigated with a mean of 3.96 and a standard deviation 0.875 the study concludes that the design and organization of learning content facilitate smooth access, enhancing the overall usability of the platform. This concurs with a study by Rehman et al., (2024) who supports the idea that clear navigation of digital platforms reduces cognitive load when accessing digital content.

Additionally, students pointed out that learning content on Zeraki learning was available when needed with a mean of 3.97 and a standard deviation of 0.820. This theme reflects the importance of consistent content accessibility for effective learning. Rafiq et al., (2021) argue that ensuring that resources are always available supports self-paced learning and encourages regular engagement with the platform.

Moreover, students also reported that learning materials could be accessed without technical difficulties with a mean of 4.04 and a standard deviation of 0.834. From this finding the study highlighted the importance of a stable and user-friendly platform in supporting continuous learning as technical difficulties can discourage learners from using digital platforms consistently (Rahiem, 2020). Furthermore, the students agreed that Zeraki learning loads quickly and works well on the devices they use with a mean of 4.02 and a standard deviation of 0.861. This emphasizes that responsive performance and device compatibility are critical for effective mobile learning as they directly impact learners' engagement and satisfaction (Togaibayeva et al., 2022).

The study further did the aggregated score for all six items which was a mean of 4.05 and a standard deviation of 0.834, overall findings indicated that students had a positive perception of the accessibility of the Zeraki learning application which concurs with a finding by Mat et al., (2024).

The study identified five open ended questionnaire key responses as a representation of the majority view among students. This was done through a systematic review of all responses where similar ideas, themes, or repeated statements were grouped together during qualitative analysis. The responses explained how assessment features enhanced students' academic achievement in C.R.E. For instance,

R1: *Accessibility of the* Zeraki learning *enhances my academic achievement in C.R.E. because I can easily access learning materials anytime and anywhere,*

R2: *It is easier to find concepts explanations using* Zeraki learning *which helps me understand the lesson better,*

R3: *When I miss to understand teacher's explanation on something I open* Zeraki learning *and read the notes again so I understand the topic well,*

R4: *Accessibility of Zeraki learning enhances my academic achievement since I can access C.R.E. materials anytime when I need to, which gives me more time to practice and improve my understanding and*

R5: *Accessibility of Zeraki learning enhances my academic achievement because I can learn at any time without limitations which helps me stay consistent in my studies and achieve better results in Christian Religious Education*.

Students' responses show that accessibility of the mobile learning application allowed them to review lesson materials repeatedly and clarify concepts that they did not fully understand from teachers' explanations. This increased the amount of time students spent interacting with Christian Religious Education content, which contributes to improved comprehension of the concept (Hamid et al., 2024).

Further, to validate what the students pointed out, classroom observations were conducted alongside the questionnaire to enhance data triangulation (Ahmed et al.,

2024). The observations focused on how learners accessed and used the Zeraki learning a during Christian Religious Education lessons. Findings from the observations were analyzed and presented narratively. From classroom observations checklist during lesson proceedings, it was established that the majority of learners were able to log in to the Zeraki Learning within a short time at the beginning of the lesson. About 83% of the students appeared familiar with the application and were able to access their accounts with minimal assistance from the teacher, enabling them to begin the learning activities without significant delays (Palshkov et al., 2024).

Classroom observations checklist also revealed that learners were able to navigate through Zeraki learning materials with relative ease. Students were seen opening lesson notes, without experiencing major difficulties. In addition, the application generally operated smoothly on the devices used by learners, allowing them to access the learning content required during the lesson (Rafiq et al., 2021). Furthermore, the observations established that learning materials on the Zeraki learning loaded successfully when selected by learners. This enabled students to read lesson notes and access additional explanations provided within the application (Togaibayeva et al., 2022). As a result, learners were able to follow the lesson activities and participate in discussions effectively.

Further, achievement tests were administered to the students in both control and experimental group before and after the intervention to establish the students' academic achievement in C.R.E.

Table 4.4: C.R.E. means scores based on gender.

Gender	Pretest Mean score	Posttest mean score
Male students	8.13	13.09
Female students	6.63	10.98

The findings from Table 4.4 indicated that both male and female students recorded an improvement in their academic achievement following the use of Zeraki learning. The male students recorded an improvement of 4.96 from the pre-test mean. Similarly, female students recorded an improvement of 4.35. The increase in scores for both male and female students suggest that exposure to the mobile learning application was

associated with improved academic achievement in Christian Religious Education. The post-test findings further show that male students recorded a higher mean score than female students, with a mean difference of 2.11. Further, paired t-test for the experimental was done as shown in table 4.5.

Table 4.5: Paired t-Test for the Control Group

Item	pretest	posttest
Mean	6.40	8.44
Variance	4.63	28.70
Observations	169	169
Pearson Correlation	0.119	
Hypothesized Mean Difference	0	
Df	168	
t Stat	-4.798	
P(T<=t) one-tail	0.062	
t Critical one-tail	1.654	
P(T<=t) two-tail	0.125	
t Critical two-tail	1.974	

The findings in Table 4.5 showed that the difference between the means of the two tests in the control group where pretest was had a mean of 6.40 and standard deviation of 2.15 and the posttest had a mean of 8.44 and standard deviation of 5.36. This means that there was improvement in the control group without any teaching intervention. In addition, an independent t-test for both the experimental and control group posttest was done as shown in table 4.6.

Table 4.6: Paired t-test for the Experimental Group

Item	**Pretest**	**Posttest**
Mean	7.30	11.99
Variance	3.32	3.18
Observations	169	169
Pearson Correlation	0.202	
Hypothesized Mean Difference	0	
Df	168	
t Stat	-26.775	
P(T<=t) one-tail	0 .004	
t Critical one-tail	1.654	
P(T<=t) two-tail	0.008	
t Critical two-tail	1.974	

The findings from Table 4.6 showed that the mean differences of the two tests in the experimental groups where pretest had a mean of 7.30 with a standard deviation of 1.82 and posttest had a mean of 11.99 and standard deviation of 1.78. This means that there was significant improvement in the scores of the learners with a mean difference of 4.69 meaning that the integration of mobile learning application had effect on learners' academic achievement in C.R.E. (Hamid et al., 2024). The study proceeded to compare scores of the student in the control group from the pretest and the posttest were compared as shown in table 4.7.

Table 4.7: Independent t-Test for the experimental and control group posttest.

Group	N	mean	Std dev.	df	t-value	p-value
Experimental Group	169	11.99	1.78	168	8.15	< 0.001
Control Group	169	8.44	5.36	168		

The findings in Table 4.7 show that the experimental group had a higher posttest mean score with a mean of 11.99 and standard deviation of 1.78 compared to the control group which had a mean of 8.44 and standard deviation of 5.36. This means that students in the experimental group performed significantly better than those in the control group with a mean of 3.55. Combination of school-based and learner-based factors acted together to shape these outcomes, including student level of digital literacy, internet connectivity and student prior exposure to mobile learning application, as any of these factors could confound the effect that this study investigated between mobile learning applications and CRE achievement (Gechere et al.,2025). The independent t-test results also indicated that this difference was statistically significant ($t(336) = 8.15$, $p < 0.001$) demonstrating that accessibility of mobile learning applications has effects on students' academic achievement in C.R.E. To confirm this finding, one way ANOVA was conducted on the posttest achievement test scores of the experimental and control group and the results were as summarized in table 4.8.

Table 4.8: One-way ANOVA between experimental and control group posttest achievement score

Posttest	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1068.642	1	1068.642	67.03212	.021
Within Groups	5356.592	336	15.94224		

Table 4.8 indicates that the sum of squares between groups was 1068.642 while that of within groups was 5356.592. The degree of freedom between the groups was 1 while within groups the degrees of freedom were 336. The mean square between and within the groups were 1068.642 and 15.94224 respectively. Also, table 4.8 indicates that the F value was 67.03212. The critical value of the one-way ANOVA calculated was 0.021. Since $0.021 < 0.05$, the study concluded that accessibility of mobile learning applications has statistically significant effect on students' academic achievement in C.R.E. in secondary schools in Juja sub-County. Therefore, the null hypothesis that stated that accessibility of mobile learning applications has no statistically significant effect on students' academic achievement in C.R.E. in secondary schools in Juja sub-County was rejected. However, a study examining the relationship between mobile device access, self-directed learning, and academic achievement found that access to mobile devices did not significantly influence students' self-directed learning outcomes, directly challenging the assumption that accessibility alone is sufficient to raise achievement (Li & Huang, 2025).

Based on the first objective of this study, the study established that accessibility of mobile learning applications affects the students' academic achievement in C.R.E. in secondary schools. The findings of this study were that accessibility of mobile learning applications significantly leads to improved students' academic achievement in Christian Religious Education by enabling continuous access to learning materials, promoting independent study, and enhancing active participation during lessons, as evidenced by both questionnaire responses and classroom observations. This finding concurs with other studies which report that easy access to digital learning resources increases learner engagement and time-on-task, thereby leading to improved academic achievement of the learners (Togaibayeva et al., 2022; Hamid et al., 2024).

The Technology Acceptance Model (TAM) provided a useful theoretical lens for interpreting these findings. TAM's perceived-ease-of-use construct offered a direct interpretive lens: where students reported high accessibility would predict a more favorable attitude toward the application and more sustained use, translating into greater academic achievement. This implies that when students perceived the application as easy to access and use, they were more likely to engage consistently

with learning materials, increasing their exposure to C.R.E. content and potentially enhancing academic achievement.

4.4.2 Assessment features on mobile learning applications on students' academic achievement in C.R.E.

The second objective sought to establish the effect of assessment features on mobile learning applications on students' academic achievement in C.R.E. in secondary schools. To achieve this, data was collected using questionnaires and classroom observations.

Five key responses from the open-ended questionnaire were identified as representation of the majority view among students. This was done through a systematic review of all responses where similar ideas, themes, or repeated statements were grouped together during qualitative analysis. The responses from students explained how assessment features enhanced their academic achievement in C.R.E. For instance,

R1: *The assessment feature on Zeraki Learning helps improve my academic achievement in Christian Religious Education because it provides regular quizzes that help me test my understanding,*

R2: *The assessment feature helps me because after doing the assessments, I can see my mistakes and correct them. This improves my understanding of C.R.E. content and boosts my academic achievement,*

R3: *The assessment feature improves my academic achievement because it gives instant feedback. This helps me know which areas I need to focus on,*

R4: *Yes, because the frequent tests and questions in* Zeraki learning *help me practice more. This continuous assessment improves my academic achievement in Christian Religious Education and*

R5: *The assessment feature helps improve my academic achievement by allowing me to track my progress over time. This motivates me to work harder and perform better in C.R.E. exams.*

These findings revealed that the assessment features of Zeraki learning provide opportunities for self-evaluation, reinforcement of learning, and continuous improvement, which support better academic achievement which concurs with findings by Özdemir (2025).

Moreover, Classroom Observation on Assessment Features was done and the observation focused on students' participation in quizzes and tests, interaction with feedback, completion of assessment tasks, and sustained engagement during assessment activities. From classroom observations during lesson proceedings, the study was established that the majority of learners attempted quizzes on Zeraki learning within the lesson time and that most students read feedback provided immediately after completing assessment activities. This feedback guided them in identifying mistakes and making corrections with concurs with findings by Kalleny (2020).

Observations also revealed that learners completed assessment tasks within the allocated time and often reattempted questions after receiving feedback. Students remained engaged with the assessment activities until completion, demonstrating concentration and interest in the learning tasks. These observations indicate that students actively interact with assessment features and use them to monitor their understanding, correct mistakes, and reinforce learning (Kalleny, 2020). The presence of clear questions, interactive quizzes, and timely feedback contributed to students' sustained engagement during assessment activities which results to improved academic achievement (Mahaseth et al., 2025).

An item in the questionnaire sought to establish the effect of assessment Features on Zeraki learning on students' academic achievement in C.R.E. Students were issued questionnaires with open ended and closed ended questions based on a five-point Likert scale and asked to indicate their level of agreement from a value of 1-5, 1 - Strongly Disagree (SD), 2 - Disagree (D), 3 – Neutral (N), 4 - Agree (A) and 5 - Strongly Agree(SA) with several statements regarding assessment features of the Zeraki learning.

The responses from the open-ended questionnaire were thematically analyzed and narratively presented, while the responses from the closed ended questionnaire were

analyzed using mean and standard deviation and the findings are summarized in table 4.9.

Table 4.9: Students' responses on effect of assessment features on mobile learning applications on students' academic achievement in C.R.E.

No.	Item	SD %	D %	N %	A %	SA %	Mean	Standard Deviation
1.	Zeraki learning provides regular quizzes and tests that help me assess my understanding of Christian Religious Education content.	2.2	4.2	11.4	45.6	36.6	4.10	.914
2.	Feedback from assessments in Zeraki learning helps me understand my strengths and weaknesses in the subject.	1.7	2.5	11.2	49.7	34.9	4.14	.834
3.	Assessment features in Zeraki learning motivate me to study and revise more regularly.	1.1	2.8	18.9	49.6	27.6	4.00	.822
4.	The assessments provided on Zeraki learning are clear and easy to understand.	2.0	3.2	12.0	46.0	36.8	4.12	.878
5.	I receive timely feedback on my assessments, which helps me improve my learning.	1.1	2.6	16.4	48.7	31.2	4.06	.822
6.	I find the assessment activities in Zeraki learning to be engaging and interactive.	1.3	1.8	13.8	49.4	33.7	4.12	.806
	Aggregated score						**4.09**	**.846**

Table 4.9 presents the results on the use of assessment features on the Zeraki learning and their impact on students' learning of Christian Religious Education (C.R.E.). The findings revealed that students generally agreed on several aspects regarding assessments and their effectiveness in supporting learning. The students agreed that Zeraki learning provides regular quizzes and tests that helped them assess their understanding of C.R.E. content with a mean of 4.10 with a standard deviation of 0.914. This finding revealed that students value frequent assessments as a tool for monitoring their own learning. Prior studies have pointed out that regular quizzes and formative assessments in mobile learning platforms enhance learners' self-regulation (Nadeem & Al Falig, 2020).

Further, students revealed that feedback from assessments on Zeraki learning helped them understand their strengths and weaknesses in the learning area with a mean of 4.14, and a standard of 0.834. This shows that students recognize the role of timely and meaningful feedback in guiding their learning. Moreover, existing literature emphasizes that feedback in digital learning environments is crucial for identifying learning gaps and improving academic outcome (Kalleny, 2020).

Additionally, students also agreed that assessment features on Zeraki learning motivated them to study and revise more regularly with a mean of 4.00 and a standard deviation of 0.822. This implies that students perceive assessments as motivating tools that encourage consistent study habits. Research done by Kalleny, (2020) supports the notion that mobile-based assessments can enhance learners' motivation, engagement, and persistence in learning activities. Students also reported that the assessments provided are clear and easy to understand with a mean of 4.12 and a standard deviation of 0.878. This finding reveals that well-structured and understandable assessment activities contribute to effective learning. A study that was done by Mahaseth et al., (2025) showed that clarity in assessment design contribute to effective learning and improve learning outcomes.

Moreover, the students agreed that receiving timely feedback on assessments helped them improve their learning with a mean of 4.06 and a standard deviation of 0.822. This reveals that students perceive immediate or prompt feedback as a vital component of mobile learning, reinforcing their understanding and guiding subsequent study

efforts. This concurs with literature which confirms that timely feedback significantly enhances learning outcomes (Kalleny, 2020).

Additionally, the students revealed that they found the assessment activities in Zeraki learning engaging and interactive with a mean of 4.12 and a standard deviation of 0.806. This reveals that interactive and engaging assessments contribute positively to students' learning experiences. Research done by Kalleny (2020), supports this view, noting that interactive digital assessments, such as quizzes, simulations, and multimedia exercises, increase learner motivation and engagement.

Overall, the aggregated score with a mean of 4.09 and a standard deviation of 0.846, indicate that students generally agreed that mobile learning applications assessment features effectively support learning in C.R.E. The findings align with existing literature that highlights the importance of regular, clear, engaging, and feedback-oriented assessments in enhancing learner understanding and achievement in digital learning environments (Kalleny, 2020; Mahaseth et al., 2025). To confirm this finding, A simple linear regression analysis was conducted to determine whether assessment features of mobile learning applications significantly predicted students' academic achievement in Christian Religious Education and the results were as summarized in table 4.10.

Table 4.10: Simple Linear Regression Analysis

R	R Square	Adjusted R Square	Std. Error of the Estimate	t	p-value
0.657	0.432	.420	4.309	5.98,	<.001

The findings from Table 4.10 indicates a moderately strong positive relationship between assessment features in mobile learning applications and students' academic achievement (R = .657). This implies that as the assessment features in mobile learning applications increases, students' academic achievement also tends to improve. The coefficient of determination (R^2 = .432) indicates that 43.2% of the variation in students' academic achievement was explained by assessment features of the mobile learning application. This demonstrates that assessment features made a substantial

contribution to explaining students' academic achievement. However, other contextual and school-based factors also contribute to academic achievement in C.R.E.

The regression coefficient was statistically significant ($t = 5.98$, $p < .001$). Since the p-value was less than the significance level of 0.05, hence the null hypothesis that stated that there is no statistically significant effect of assessment features in mobile learning applications on students' academic achievement in Christian Religious Education in secondary schools in Juja Sub-County was rejected. Based on the second objective of this study, the study established that assessment features on mobile learning applications affects the students' academic achievement in C.R.E. in secondary schools, by promoting continuous practice, self-evaluation, and immediate feedback, as supported by both questionnaire responses and classroom observations. The study finding concurs with other studies which indicate that formative assessment tools and timely feedback in digital learning environments improve learners' understanding, retention, and overall academic achievement of the learners (Özdemir, 2025; Kalleny, 2020).

The findings were interpreted through the Technology Acceptance Model (TAM), which suggested that perceived-usefulness construct is the more relevant lens: a quiz or feedback function will only be associated with improved CRE achievement if learners perceive it as genuinely enhancing their revision and performance. Therefore, if learners perceive mobile learning application as genuinely enhancing their revision and performance, they will frequently use it and may strengthen the learning of C.R.E. concepts and contribute to improved academic achievement.

4.4.3 Multimedia features on mobile learning application on student academic achievement in C.R.E.

The third objective was to establish the effect of multimedia features in mobile learning applications on students' academic achievement in Christian Religious Education. This objective data was gathered using questionnaires and observation checklists. Students were issued with questionnaire with both closed and open-ended questions.

The study identified five key responses from the open-ended questions as a representation the major students' view on how multimedia features enhanced students' academic achievement in C.R.E. For instance,

R1: *The multimedia content on Zeraki Learning improves my academic achievement in Christian Religious Education because videos and images help me understand concepts more clearly than reading alone*,

R2: *It helps me because audio explanations and videos make learning more interesting. This keeps me engaged and helps me remember what I learn*

R3: *Multimedia content improves my academic achievement because it simplifies difficult concept and watching videos helps me understand lessons faster,*

R4: *Multimedia improves my academic achievement because of the use of images and videos makes learning more interactive and helps me grasp key concepts easily and*

R5: *The multimedia content helps improve my academic achievement by making learning enjoyable and easier to understand which increases my concentration and leads to better results in C.R.E.*

The study established that multimedia features promote better comprehension, enhance memory retention, and increase students' motivation, all of which contribute to improved academic achievement in Christian Religious Education which concurs with findings by (Qasserras, (2024); Hartika et al., (2024); Staneviciene & Žekienė, 2025).

Further, to validate what the students revealed, Classroom Observations on Multimedia Features was conducted whereby observations focused on learners' engagement with multimedia content on Zeraki learning. From classroom observations during lesson proceedings, the study established that most learners actively viewed images displayed on Zeraki learning. Learners were observed listening attentively to audio explanations and referring back to multimedia content when responding to tasks or answering questions.

Students were generally focused and watched and listened to multimedia materials without distraction. The learners frequently revisited videos and images to clarify concepts and confirm their understanding during lesson activities (Qasserras, 2024; Hartika et al., 2024). This revealed sustained engagement with multimedia features throughout the lesson. However, there was a limited challenge on slow loading of some videos and audio explanations was experienced due to internet connectivity.

An item in the questionnaire sought students view on effect of multimedia features on mobile learning applications on students' academic achievement in C.R.E. the closed ended questionnaires were based on a five-point Likert scale and students were asked to indicate their level of agreement from a value of 1-5, 1 - Strongly Disagree (SD), 2 - Disagree (D), 3 – Neutral (N), 4 - Agree (A) and 5 - Strongly Agree(SA), with several statements regarding multimedia features of the mobile learning application. The responses from the open-ended questions were thematically analyzed and narratively presented, while the responses from the closed ended questions were analyzed using mean and standard deviation and the findings are summarized in table 4.11.

Table 4.11: Students view on effect of multimedia features on mobile learning application on students' academic achievement in C.R.E.

Item No.	Multimedia items	SD %	D %	N %	A %	SA %	Mean	Standard deviation
1.	Multimedia features on Zeraki learning help me understand Christian Religious Education content better.	1.1	3.6	20.6	46.3	28.4	3.97	.856
2.	Multimedia features on Zeraki learning help me remember key concepts and information more effectively.	1.5	3.8	24.3	38.7	31.7	3.95	.919
3.	Audio explanations on Zeraki learning improve my understanding of difficult concepts.	1.7	2.7	17.5	51.7	29.8	4.15	.858
4.	Visual elements on Zeraki learning help me grasp concepts faster	1.2	1.1	26.8	37.5	33.4	4.01	.868
5.	The use of multimedia on Zeraki learning motivates me to study more regularly.	1.4	2.5	11.9	49.6	34.6	4.14	.820
6.	The multimedia content on Zeraki learning is clear, relevant, and easy to understand.	0.9	2.9	21.9	39.8	34.5	4.04	.820
	Aggregated Score						**4.04**	**.857**

Table 4.11 presents the findings on multimedia features on the mobile learning application and their impact on students' academic achievement in Christian Religious Education (C.R.E.). The results demonstrate that students generally agreed on the importance of multimedia in enhancing learning. Firstly, students agreed that

multimedia features on Zeraki learning helped them understand C.R.E. content better with a mean of 3.97 and standard deviation of 0.856. This finding reveals that learners value multimedia as a tool to clarify and reinforce content.

Literature supports this observation, indicating that multimedia elements can enhance comprehension by catering to different learning styles and making abstract concepts more concrete (Abdulrahaman et al., 2020). Secondly, students indicated that multimedia features helped them remember key concepts and information more effectively with a mean of 3.95 and standard deviation of 0.919. This reveals that learners perceive multimedia as beneficial for knowledge retention. Previous studies have emphasized that audio-visual elements in learning applications strengthen memory by providing dual coding through both visual and auditory channels (Mir et al., 2023).

Furthermore, the students reported that audio explanations on Zeraki learning helped in improving their understanding of difficult concepts with a mean of 4.15 and standard deviation of 0.858. This finding reveals that students value detailed and clear explanations delivered through audio, which supports understanding of challenging content. Research confirms that audio narration in digital learning increases engagement and reduces cognitive load, improving learners' conceptual grasp (Barua, 2023).

In addition, students agreed that visual elements on mobile learning application helped them grasp concepts faster with a mean of 4.01 and standard deviation of 0.868. This finding reveals that visual representations of information enhance learning by simplifying complex content and enabling quicker comprehension. Studies in mobile learning support the use of visual aids as essential for meaningful learning and concept mastery (Qasserras, 2024). Moreover, the students indicated that the use of multimedia on Zeraki learning motivated them to study more regularly with a mean of 4.14 and standard deviation of 0.820. This reveals that interactive and appealing multimedia content encourages consistent learning habits. Literature emphasizes that engaging multimedia content increases learner motivation, participation, and persistence in mobile learning environments (Hartika et. al., 2024). The students also agreed that the multimedia content on Zeraki learning was clear, relevant, and easy to understand with a mean of 4.04 and standard deviation of 0.820. This finding revealed that learners

value not just the presence of multimedia but also its clarity and relevance to the subject matter. This concurs with prior studies support the importance of well-structured and meaningful multimedia in facilitating effective learning outcomes (Staneviciene, & Žekienė, 2025).

The overall aggregated score of all multimedia items with a mean of 4.04 and standard deviation of 0.857, revealed that students generally agreed that multimedia features in the Zeraki learning application enhance comprehension, retention, motivation, and engagement in C.R.E. The findings align with existing literature, highlighting the critical role of multimedia in supporting interactive and effective mobile learning experiences (Staneviciene, & Žekienė, 2025). A simple linear regression analysis was conducted to determine whether the multimedia features in mobile learning applications have effect on students' academic achievement in Christian Religious Education and the results were as summarized in table 4.12.

Table 4.12: Students view on effect of multimedia features on mobile learning application on students' academic achievement in C.R.E.

R	R Square	Adjusted R Square	Std. Error of the Estimate	t	p-value
0.641	0.411	.401	1.349	4.312	< .001

The findings from Table 4.12 indicate a moderately strong positive relationship between the multimedia features in mobile learning applications and students' academic achievement (R = .641). This implies that as the multimedia features in mobile learning applications increases, students' academic achievement also tends to improve. The coefficient of determination (R^2 = .411) indicates that 41.1% of the variation in students' academic achievement was explained by the multimedia features in mobile learning applications. This suggests that the multimedia features in mobile learning applications is an important predictor of academic achievement. However, other contextual and school-based factors also contribute to academic achievement in C.R.E. The regression coefficient was statistically significant (t = 4.312, p < .001). Since the p-value is less than the significance level of 0.05, the multimedia features in mobile learning applications have statistically significant effect on students' academic achievement in C.R.E., hence the null hypothesis that stated that multimedia features in mobile learning applications have no statistically significant effect on students'

academic achievement in C.R.E. in secondary schools in Juja Sub-County was rejected.

Based on the third objective of this study, the study established that multimedia features on mobile learning applications affects the students' academic achievement in C.R.E. in secondary schools, by improving understanding, retention, and engagement through the use of videos, audio, and visual elements, as supported by both questionnaire responses and classroom observations. The study finding concurs with other studies which show that multimedia-supported learning enhances cognitive processing and leads to better academic achievement compared to text-only instructional methods (Staneviciene & Žekienė, 2025). The findings were interpreted through the Cognitive Theory of Multimedia Learning (CTML), which suggested that appropriately designed combinations of words and visuals can support learners' cognitive processing and understanding. Therefore, the effective integration of multimedia features into mobile learning applications may strengthen the learning of C.R.E. concepts and contribute to improved academic achievement.

4.5 Chapter Summary

The first objective aim was to establish the effect of accessibility of mobile learning applications and academic achievement in C.R.E. The findings from closed ended questionnaires showed that majority of students agreed that the mobile learning application was easily accessible and enabled them to conveniently access learning materials. Findings from the open-ended questionnaires demonstrated that they were able to log into the application without difficulty and navigate through the learning materials with relative ease. Findings from classroom observations supported the questionnaire responses. Observations revealed that most learners were able to log into the application quickly at the beginning of lessons and navigate learning materials without experiencing significant technical challenges. Students were observed retrieving learning materials through the application while participating in classroom discussions.

The findings from the posttest show that the mean score of the experimental group was greater than that of the control group meaning the students performed better than those in the control group. The two groups posttest mean difference in the achievement test demonstrate that accessibility of mobile learning applications enhanced students'

engagement with Christian Religious Education content and contributed to improved academic achievement. The critical value of the one-way ANOVA calculated was 0.021. Since 0.021 < 0.05, hence the null hypothesis that stated; accessibility of mobile learning applications has no statistically significant effect on students' academic achievement in C.R.E. in secondary schools in Juja sub-County was rejected.

The second objective aimed at establishing the effect of assessment features on mobile learning applications on academic achievement in C.R.E. From the open-ended questionnaire students' responses showed that majority of the respondents agreed that assessment feature on mobile learning applications enabled them to identify their strengths and weaknesses in the learning area and guided them on areas that required further revision and that the feedback provided after completing assessment activities helped them understand their mistakes and improve their academic achievement. The classroom observations revealed that learners actively attempted quizzes and tests during lessons and carefully read the feedback provided after completing the assessments. The assessment features on the mobile learning application promote active learning, self-evaluation, and continuous improvement in students' understanding of Christian Religious Education content, contributing positively to students' academic achievement.

Findings from the closed ended questionnaires revealed that most students agreed that the assessment features in mobile learning application affected their academic achievement in Christian Religious Education. The regression coefficient was statistically significant ($t = 5.98$, $p < .001$). Since the p-value was less than the significance level of 0.05, hence the null hypothesis that stated that there is no statistically significant effect of assessment features in mobile learning applications on students' academic achievement in Christian Religious Education in secondary schools in Juja Sub-County was rejected.

The third objective aimed at establishing the effect of multimedia features on mobile learning applications on academic achievement in C.R.E. Findings from the open-ended questionnaire revealed that multimedia features make it easier for students to understand and remember the lessons with audio explanations clarifying difficult concepts and reinforcing learning. Observations showed that learners actively viewed images and listened to audio explanations in the mobile learning application during

lessons. Multimedia features on mobile learning applications enhances students' comprehension, engagement, and retention of Christian Religious Education content, which contribute to improved academic achievement.

The closed ended questionnaire findings indicated that most students agreed that multimedia features on mobile learning application improved their academic achievement in C.R.E. The regression coefficient was statistically significant ($t = 4.312$, $p < .001$). Since the p-value is less than the significance level of 0.05, the multimedia features in mobile learning applications have statistically significant effect on students' academic achievement in C.R.E., hence the null hypothesis; Multimedia features in mobile learning applications have no statistically significant effect on students' academic achievement in C.R.E. in secondary schools in Juja Sub-County was rejected.

CHAPTER FIVE
CONCLUSION, RECOMMENDATIONS AND FUTURE WORK

5.1. Conclusion of the Study

Basing on the findings of the research, the following conclusions were arrived at: Accessibility of mobile learning applications have effect on the students' academic achievement in C.R.E. It enhances students' engagement with content thus contributing to improved academic achievement. The significance of this conclusion is that mobile learning applications can provide students with opportunities to access C.R.E. learning content beyond the limitations of the traditional classroom environment. Improved accessibility can facilitate continuous engagement with learning materials, promote learner autonomy, and provide students with additional opportunities to review C.R.E. concepts resulting to improved academic achievement.

The conclusion has implications for school administrators, teachers and technology developers. Schools should promote equitable access to smartphones and reliable internet connectivity to enable students to benefit from mobile learning. School administrators should consider strategies for reducing digital access barriers, including strengthening school ICT infrastructure and supporting affordable internet connectivity. Teachers should also guide students on how to access and navigate mobile learning applications effectively.

Assessment features on mobile learning applications have effect on students' academic achievement in C.R.E. They promote active learning, self-evaluation, and continuous improvement in students' understanding of content, contributing positively to students' academic achievement.

The significance of this conclusion is that mobile learning applications can transform assessment from an occasional classroom activity into a continuous learning process. Through frequent quizzes and timely feedback, students can identify areas of difficulty, monitor their progress, correct misconceptions, and reinforce their understanding of C.R.E. concepts. The conclusion has important implications for C.R.E. teachers. Teachers should integrate digital assessment features into C.R.E. instruction to provide learners with regular opportunities to practice and evaluate their

understanding. Teachers can also use performance information generated by mobile learning applications to identify areas where students require additional support and to differentiate instruction according to learners' needs.

Multimedia features on mobile learning applications have effect on students' academic achievement in C.R.E. They enhance students' comprehension, engagement, and retention of content, leading to improved academic achievement. Mobile learning applications integration in teaching C.R.E. affects academic achievement. The significance of this conclusion is that multimedia features can present abstract, complex, or value-based C.R.E. concepts in more engaging and understandable forms. By combining verbal and visual modes of presentation, mobile learning applications can provide learners with multiple ways of interacting with content, which may promote deeper understanding information resulting to improved academic achievement.

The conclusion has implications for teachers. Teachers should purposefully integrate relevant multimedia resources into lessons to supplement classroom instruction and make learning more engaging and meaningful.

5.2. Recommendations

Schools should invest on buying smartphones or tablets and all teachers to adopt mobile learning applications in their instructional practices in teaching different learning areas.

Further, schools should ensure reliable access to electricity and internet to facilitate uninterrupted use of mobile learning applications.

5.3 Future Work

The following suggestions are made for further work;

i. Longitudinal studies are needed to establish the effect of mobile learning application on students' academic achievement in C.R.E. over time, offering a clearer understanding of their long-term effects on learning outcomes in C.R.E.

ii. This study focused on mobile learning applications on students' academic achievement in C.R.E. in secondary schools Juja Sub-County, other studies should be done focusing on junior school or senior school in different locality.

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APPENDICES

Appendix 1: Introduction Letter

Dear Respondent,

I am Caroline Wangari Macharia, a postgraduate student at Murang`a University Technology pursuing a master of education educational communication and technology. As part of the requirements for the award of this degree, I am conducting a research study on effect of mobile learning applications on students' academic achievement in C.R.E. among secondary schools.

You have been selected to participate in this study, and I kindly request you to respond to the questions provided as truthfully as possible. The study is purely academic, and the information you provide will be used strictly for the stated research purposes. All responses will be treated with utmost confidentiality, and no identifying information will be disclosed.

Your cooperation and participation in this study will be highly appreciated, as it will contribute significantly to the success of the research.

Caroline Wangari Macharia

Appendix 2: Letter to Principals Requesting Permission

Dear principal,

I am a postgraduate student at Murang'a University of Technology conducting doing research on effect of mobile learning applications on students' academic achievement in Christian religious education in secondary schools in Kiambu county, Kenya. I kindly request your consent to conduct this study at your institution.

This study will concern form 3 students undertaking pretest and posttests on selected C.R.E. topics, unity of believers and selected Old Testament prophets and their teachings, and filling in to questionnaires about their learning experience mobile learning application (Zeraki learning). Participation will be completely voluntary and any data gathered from your school will be kept strictly confidential. Informed consent will be gathered from form three C.R.E. parents or guardians, and assent will be asked from the form three C.R.E. students. I would be grateful for your consent to carry out this study at your school.

Thank you very much for your time and consideration.

Sincerely,

Caroline Wangari Macharia

Appendix 3: Parental Consent Form

1. Parental Consent Form (Experimental group)

Title of Study: Effect of mobile learning applications on students' academic achievement in Christian religious education in secondary schools in Kiambu county, Kenya

Researcher: Caroline Wangari Macharia

Institution: Murang'a University of Technology

Introduction

The objective of this form is to present you as the parent or guardian of a prospective respondent in a research study, with details that might impact your decision, on whether to permit your child to get involved in this research study or not. Before you choose on whether to or not to let your child to take part in the research study, go through the information provided below and raise any concerns you may have. This form will be used as an approval of your permission if you decide to let your child to get involved in the study.

Purpose of the Study

If you allow, your child will be requested to take part in a research study on establishing effect of mobile learning applications on students' academic achievement in Christian religious education in secondary schools in Kiambu county, Kenya. The goal of the study to understand whether use of mobile learning application in teaching Christian religious education (C.R.E.) affects academic achievement C.R.E. among Form 3 students.

What Will Be Expected of My Child in this Research Study

If you allow for your child to be part students in this study, he or she will Use a mobile learning application (Zeraki learning) as part of the study for about 3 weeks, she or he will also undergo pretest and post-tests on form 3 C.R.E. topics and fill in questionnaires that will cover aspects such as, accessibility of Zeraki learning, assessment features in Zeraki learning application and multimedia features in Zeraki learning.

Risks in this study

The research study has the potential to introduce minimal psychological risks, as the students might get anxious as they partake pretest and posttest. In regard to this risk, the entire process will be made detailed explained to the students and made to understand that participation is wholly voluntary and has no influence on their subject grades. Students displaying signs of discomfort will be to choose to withdraw.

Benefits Being in this Study

Your child might benefit from better comprehension of C.R.E. topics on unity of believers and selected Old Testament prophets and their teachings. Also, the data that your child will provide will aid in enhancing teaching strategies in C.R.E. using mobile learning applications.

Confidentiality

All provided information by your child will be kept confidential by use of a passcode index to locate your child in an encrypted computer record system and will store all of pretest, posttest and delayed posttest results in a secure file cabinet.

Parent/guardian statement

By signing below, you agree that you read this consent form and voluntarily approve my child to take part in this study. You can withdraw this permission for your child to take part in the study at any time without giving any reasons and penalty.

You will be given a copy of this consent form.

Child's Name: _____

Parent/Guardian Name: _____

Signature of Parent/Guardian: _____

Date: _____

Researcher Name: _____

Signature of Researcher: _____

Date: _____

2. **Parental Consent Form (control group)**

Title of Study: Effect of Mobile Learning Applications on Students' Academic Achievement in Christian Religious Education in Secondary Schools in Kiambu County, Kenya

Researcher: Caroline Wangari Macharia

Institution: Murang'a University of Technology

Introduction

The objective of this form is to present you as the parent or guardian of a prospective respondent in a research study, with details that might impact your decision, on whether to permit your child to get involved in this research study or not. Before you choose on whether to or not to let your child to take part in the research study, go through the information provided below and raise any concerns you may have. This form will be used as an approval of your permission if you decide to let your child to get involved in the study.

Purpose of the Study

If you allow, your child will be requested to take part in a research study on establishing effect of mobile learning applications on students' academic achievement in Christian religious education in secondary schools in Kiambu county, Kenya. The goal of the study to understand whether use of mobile learning application in teaching Christian religious education (C.R.E.) affects the academic achievement C.R.E. among Form 3 students.

What Will Be Expected of My Child in this Research Study

If you allow for your child to be part students in this study, she or he will also undergo pretest and post-tests on form 3 C.R.E. topics under the study.

Risks in this study

The research study has the potential to introduce minimal psychological risks, as the students might get anxious as they partake pretest and posttest. In regard to this risk, the entire process will be made detailed explained to the students and made to

understand that participation is wholly voluntary and has no influence on their subject grades. Students displaying signs of discomfort will be to choose to withdraw.

Benefits Being in this Study

Your child might benefit from better comprehension of C.R.E. topics on unity of believers and selected Old Testament prophets and their teachings.

Confidentiality

All provided information by your child will be kept confidential by use of a passcode index to locate your child in an encrypted computer record system and will store all of pretest, posttest and delayed posttest results in a secure file cabinet.

Parent/guardian statement

By signing below, you agree that you read this consent form and voluntarily approve my child to take part in this study. You can withdraw this permission for your child to take part in the study at any time without giving any reasons and penalty.

You will be given a copy of this consent form.

Child's Name: _____

Parent/Guardian Name: _____

Signature of Parent/Guardian: _____

Date: _____

Researcher Name: _____

Signature of Researcher: _____

Date: _____

Appendix 4: Assent Form

1.Assent Form (experimental group)

Title of Study: Effect of mobile Learning Applications on Students' Academic Achievement in Christian Religious Education in Secondary Schools in Kiambu County, Kenya

Researcher: Caroline Wangari Macharia

Institution: Murang'a University of Technology

Introduction

You are requested to take part in a research study stated above. Prior to choosing whether to or not to participate, please read the information provided below and raise any concern you may have.

Purpose of the Study

The purpose of this research study is to establish effect of mobile learning applications on students' academic achievement in Christian religious education in secondary schools in Kiambu county, Kenya.

What is expected of you

If you agree to participate, you will be asked use a mobile learning application (Zeraki learning) as part of the study for about 3 weeks, she or he will also undergo pretest and post-tests on form 3 C.R.E. topics on unity of believers and selected Old Testament prophets and their teachings and fill in questionnaires that will cover aspects such as, accessibility of Zeraki learning, assessment features in Zeraki learning and multimedia features in Zeraki learning.

Risks in this study

The research study has the potential to introduce minimal psychological risks, as you might get anxious as you partake pretest and posttest. In regard to this risk, you are made to understand that participation is wholly voluntary and has no influence on their learning area grades. Students displaying signs of discomfort might choose to withdraw.

Benefits Being in this Study

You might benefit from better comprehension of C.R.E. topics on unity of believers and selected Old Testament prophets and their teachings. Also, the data that you will provide will aid in enhancing teaching strategies in C.R.E. using mobile learning applications.

Confidentiality

Your response will be kept confidential by use of a passcode index to locate your child in an encrypted computer record system and will store all of pretest and posttest results in a secure file cabinet. You will not use your name in the pretest and posttest but instead you will use index given.

Permission to Participate

If you choose to withdraw after you beginning participating in this research, it is okay. Your parents know about this study too. If you have read and understood the information given this assent form and agree to take part in this study, kindly sign below.

Student's Name: _____

Student's Signature: _____

Date: _____

Researcher's Name: _____

Researcher's Signature: _____

2.Assent Form (control group)

Title of Study: Effect of Mobile Learning Applications on Students' Academic Achievement in Christian Religious Education in Secondary Schools in Kiambu County, Kenya

Researcher: Caroline Wangari Macharia

Institution: Murang'a University of Technology

Introduction

You are requested to take part in a research study stated above. Prior to choosing whether to or not to participate, please read the information provided below and raise any concern you may have.

Purpose of the Study

The purpose of this research study is to establish effect of mobile learning applications on students' academic achievement in Christian religious education in secondary schools in Kiambu county, Kenya.

What is expected of you

If you agree to participate, you will undergo pretest and post-tests on form 3 C.R.E. topics on unity of believers and selected Old Testament prophets and their teachings.

Risks in this study

The research study has the potential to introduce minimal psychological risks, as you might get anxious as you partake pretest and posttest. In regard to this risk, you are made to understand that participation is wholly voluntary and has no influence on their subject grades. Students displaying signs of discomfort might choose to withdraw.

Benefits Being in this Study

You might benefit from better comprehension of C.R.E. topics on unity of believers and selected Old Testament prophets and their teachings.

Confidentiality

Your response will be kept confidential by use of a passcode index to locate your child in an encrypted computer record system and will store all of pretest and posttest results in a secure file cabinet. You will not use your name in the pretest and posttest but instead you will use index given.

Permission to Participate

If you choose to withdraw after you beginning participating in this research, it is okay. Your parents know about this study too. If you have read and understood the information given this assent form and agree to take part in this study, kindly sign below.

Student's Name: _____

Student's Signature: _____

Date: _____

Researcher's Name: _____

Researcher's Signature: _____

Appendix 5: Data Collection Instruments

1.Questionnaire

Dear participant,

The questionnaire is developed to collect data on mobile learning applications on students' academic achievement in C.R.E. among secondary schools in Juja Sub-County. You have been chosen to take part in this study, please tick or fill in this questionnaire with your most suitable response, your response will be kept privately and solely utilized for educational uses.

Thanks for your cooperation.

Instructions

- Do not write your personal Names or Name of your institution.
- Write your admission number and school code on the questionnaire for easy identification.
- Before selecting an answer, carefully read statement and understand it clearly.
- Put a checkmark (√) or cross (x) on the scale of your choice.

SECTION A: DEMONGRAPHIC INFORMATION

1. What is your sex?

Male [ ] Female [ ]

2. What is your age bracket?

15–16 years [ ] 17–18 years [ ] Above 19 [ ]

SECTION B: ACCESSIBILITY OF MOBILE LEARNING APPLICATION

The items on the table below are on accessibility of mobile learning application. Please indicate your level of agreement with each statement, using the given scale.

Scale; 1 - Strongly Disagree (SD), 2 - Disagree (D), 3 – Neutral (N), 4 - Agree (A) and 5 - Strongly Agree.

(Tick ✓only once for each item)

NO.	Item	SD	D	N	A	SA
1.	I can easily log in to the Zeraki learning whenever I need to					
2.	I have reliable internet access that allows me to use Zeraki Learning regularly					
3.	I can easily navigate lessons and learning materials on Zeraki Learning.					
4.	Zeraki Learning content is always available when I need it for learning					
5.	I can access learning materials on Zeraki Learning without technical difficulties.					
6.	Zeraki learning loads quickly and works well on the device I use					

7. Does accessibility of Zeraki learning enhance your academic achievement in Christian religious education? How?

_____

_____

SECTION C: ASSESSMENT FEATURES ON MOBILE LEARNING APPLICATION

The items on the table below are on assessment features on Zeraki learning. Please Indicate your level of agreement with each of the following statements using the given scale. Scale; 1 - Strongly Disagree (SD), 2 - Disagree (D), 3 – Neutral (N), 4 - Agree (A) and 5 - Strongly Agree.

(Tick ✓only once for each item)

NO.	Item	SD	D	N	A	SA
1.	Zeraki Learning provides regular quizzes and tests that help me assess my understanding of Christian Religious Education content.					
2.	Feedback from assessments in Zeraki learning helps me understand my strengths and weaknesses in the subject.					
3.	Assessment features in Zeraki learning motivate me to study and revise more regularly.					
4.	The assessments provided are clear and easy to understand.					
5.	I receive timely feedback on my assessments, which helps me improve my learning.					
6.	I find the assessment activities in Zeraki learning to be engaging and interactive.					

7. Do the assessment features on Zeraki learning help you improve your academic achievement in Christian Religious Education? How?

SECTION D: MULTIMEDIA FEATURES ON MOBILE LEARNING APPLICATIONS

The items on the table below are on multimedia features on mobile learning application. Please Indicate your level of agreement with each of the following statements using the given scale.

Scale; 1 - Strongly Disagree (SD), 2 - Disagree (D), 3 – Neutral (N), 4 - Agree (A) and 5 - Strongly Agree.

(Tick ✓only once for each item)

NO.	Item	SD	D	N	A	SA
1.	Multimedia features on Zeraki learning (videos, images, audio) help me understand Christian Religious Education content better.					
2.	Multimedia features on Zeraki learning help me remember key concepts and information more effectively.					
3.	Audio explanations on Zeraki learning improve my understanding of difficult concepts.					
4.	Visual elements on Zeraki learning help me grasp concepts faster.					
5.	The use of multimedia on Zeraki learning motivates me to study more regularly.					
6.	The multimedia content on Zeraki learning is clear, relevant, and easy to understand.					

7. Do the multimedia features on Zeraki learning help you improve your academic achievement in Christian Religious Education? How.

_____

_____

2.Observation checklist

This observation checklist is designed for data collection on how Zeraki learning is integrated into Christian Religious Education (C.R.E.) lessons.

The researcher will comment on the extent to which each statement is demonstrated during the lesson.

Date: _____

SECTION A: ACCESSIBILITY OF MOBILE LEARNING APPLICATION

No	Item	Comments
1.	Most learners log in to the Zeraki Learning within a short time at the beginning of the lesson	
2.	Learners navigate Zeraki learning materials without difficulty.	
3.	Learners experience minimal technical challenges when accessing Zeraki learning	
4.	Zeraki learning operates smoothly on the devices used by learners.	
5.	Learning content loads successfully when selected by learners.	

.

SECTION B: ASSESSMENT FEATURES ON MOBILE LEARNING APPLICATION

No	Item	Comments
1.	Learners attempt quizzes and tests on Zeraki learning during the lesson.	
2.	Learners view and read feedback provided after completing assessments.	
3.	Learners' complete assessment tasks within the allocated time.	
4.	Learners make corrections or reattempt questions after receiving feedback.	
5.	Learners remain engaged with assessment activities until completion.	

.

SECTION C: MULTIMEDIA FEATURES IN MOBILE LEARNING APPLICATIONS

No.	Item	Comments
1.	Learners view images, diagrams, or charts displayed in Zeraki learning.	
2.	Audio explanations are played and listened to during the lesson.	
3.	Learners refer back to multimedia content when responding to tasks.	
4.	Learners watch or listen to multimedia content without distraction	

3.Achievement tests

This achievement tests have been developed to help in establishing the effect of mobile learning application (Zeraki learning) on students' academic achievement in C.R.E. among secondary schools. The tests will be administered in two stages: (1) administration of the pretest to both experimental and control groups, before the introduction of mobile learning applications, (2) administration of Posttest, immediately after the instructional intervention (Zeraki learning), to measure the immediate learning outcomes (students' academic achievement). The results from this achievement tests will remain confidential and solely utilized for research use.

1.PRE-TEST

STRAND: UNITY OF BELIEVERS IN THE NEW TESTAMENT

Instructions:

- Do not write your name or the name of the school on, use the codes given.
- Before submitting responses, read the questions carefully before answering.
- Answer all questions in the spaces provided.
- **Time**: 1hr 20 minutes
- 15 Marks

Index code: _____

School code: _____

1. The main teaching of unity among believers in the New Testament is based on: (1 mark)
    a) Obedience to the law
    b) Faith in Jesus Christ
    c) Fear of punishment
    d) Observance of traditions
2. Which image is used by Paul to describe believers as one unit? (1 mark)
    a) The vine and branches
    b) The body of Christ
    c) The bride
    d) The flock

3. “The Vine and the Branches” teaches believers about: (1 mark)
    a) Leadership
    b) Dependence on Christ
    c) Discipline
    d) Prayer
4. The Church is also referred to as: (1 mark)
    a) The synagogue
    b) The kingdom of Israel
    c) The Assembly of God
    d) The temple of idols
5. The image of the Bride in the New Testament emphasizes (1 mark)
    a) Judgment
    b) Loyalty and love
    c) Wealth
    d) Power
6. State two teachings of unity of believers found in the New Testament. (2 marks)

    _____

    _____

    _____

7. Identify two ways believers are described as the “people of God”. (2 marks)

    _____

    _____

    _____

8. Mention two characteristics of the Church as the body of Christ. (2 marks)

    _____

    _____

9. Identify two causes of disunity in the early church. (2 marks)

    _____

_____

_____

10. Suggest two possible solutions to promote unity among believers in Kenya today. (2 marks)

_____

_____

_____

Thank you

2. POST TEST

STRAND: SELECTED OLD TESTAMENT PROPHETS AND THEIR TEACHINGS

Instructions:

- Do not write your name or the name of the school on, use the codes given.
- Before submitting responses, read the questions carefully before answering.
- Answer all questions in the spaces provided.
- **Time**: 1hr 20 minutes
- 15 Marks

Index code: _____

School code: _____

1.A prophet is best described as a person who: (1 mark)

a) Predicts the future
b) Teaches history
c) Speaks God's message to the people
d) Leads worship

2.Prophecy in the Old Testament mainly involved: (1 mark)

a) Dream interpretation
b) Delivering God's message
c) Writing laws
d) Leading armies

3.Which of the following is a category of Old Testament prophets? (1 mark)

a) Apostles

b) Judges

c) Major prophets

d) Disciples

4.One importance of prophets in Israel was to: (1 mark)

a) Collect taxes

b) Interpret dreams only

c) Guide people back to God

d) Build temples

5.A true prophet was expected to: (1 mark)

a) Please the king

b) Speak God's message truthfully

c) Avoid conflict

d) Predict success only

6. State two characteristics of true prophets. (2 marks)

_____

_____

7.Give two characteristics of false prophets. (2 marks)

_____

_____

8.State two contents of prophetic messages in the Old Testament. (2 marks)

_____

_____

_____

9. State two similarities between prophets in African Traditional Society and Old Testament prophets. (2 marks)

_____

_____

_____

10.State two differences between prophets in African Traditional Society and Old Testament prophets. (2 marks)

_____

_____

_____

_____

Thank you

Appendix 6: Achievement Test Marking Scheme

Pre-Test Marking Scheme

1. Faith in Jesus Christ

2. The body of Christ

3. Dependence on Christ

4. The Assembly of God

5. Loyalty and love

6.Teachings of unity of believers in the New Testament

- Believers are one body in Christ
- Love one another
- Equality of believers before God
- Fellowship and sharing among believers

  (Any two × 1 mark)

7.Ways believers are described as the people of God

- Chosen people
- God's own possession
- Holy nation
- Royal priesthood

  (Any two × 1 mark)

8.Characteristics of the Church as the body of Christ

- Christ is the head of the church
- Members have different roles/functions
- Unity and interdependence among members

- All members are important

  (Any two × 1 mark)

9. Causes of disunity among believers in Kenya today *(2 marks)*

- Tribalism
- Leadership conflicts
- Greed and corruption
- Doctrinal differences

  (Any two × 1 mark)

10. **Possible solutions to disunity** *(2 marks)*

- Teaching love and tolerance
- Promoting dialogue and reconciliation
- Encouraging servant leadership
- Upholding Christian values

  (Any two × 1 mark)

Post-Test Marking Scheme

1. Speaks God's message to the people
2. Delivering God's message
3. Major prophets
4. Guide people back to God
5. Speak God's message truthfully

6. **Characteristics of true prophets**

   - Obedient to God
   - Spoke God's message without fear
   - Their prophecies came true
   - Called people to repentance

   (Any two × 1 mark)

7. **Characteristics of false prophets** *(2 marks)*

   - Spoke to please people or kings
   - Delivered false messages
   - Were motivated by personal gain
   - Led people away from God

   (Any two × 1 mark)

8. **Contents of prophetic messages** *(2 marks)*

   - Call to repentance
   - Condemnation of sin and injustice
   - Warning of punishment
   - Promise of hope and restoration

   (Any two × 1 mark)

9. **Similarities between ATS prophets and OT prophets** *(2 marks)*

   - Both acted as God's messengers

- Both warned people of wrongdoing
- Both guided societies morally

  (Any two × 1 mark)

10. **Differences between ATS prophets and OT prophets** *(2 marks)*

- OT prophets received messages from Yahweh, ATS prophets from spirits/ancestors
- OT prophets' messages are recorded in the Bible, ATS prophets' messages are oral
- OT prophets emphasized covenant faithfulness, ATS prophets emphasized tradition

  (Any two × 1 mark)

Appendix 7: Teaching Module for Research

Introduction

This training module was used to guide teachers during induction process for C.R.E. teachers on mobile learning application based instructional approach in teaching and learning C.R.E.

Orientation and Mobile Learning Induction

The teacher introduces the mobile learning application and orients learners on the use of the Zeraki learning. The teacher explains the expected acceptable use of mobile devices during the lesson. Learners are guided on logging into the application, navigating learning content, and following digital classroom rules.

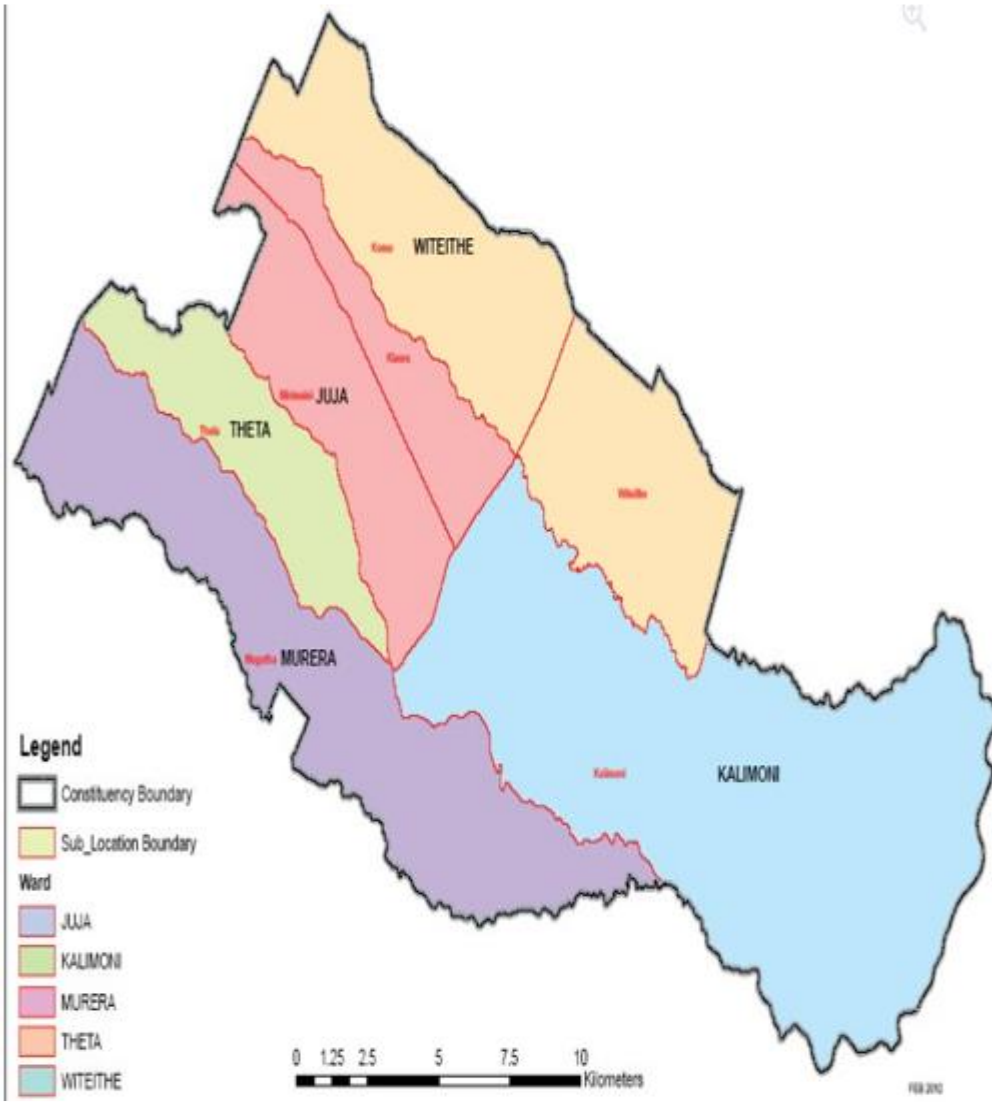
Preparation of sample lesson plan

Teachers will be required to prepare a sample lesson plan integrating the Zeraki Learning as an instructional approach in the teaching and learning of Christian Religious Education (C.R.E.)**.** Each teacher will design a lesson plan demonstrating how Zeraki Learning can be used to enhance academic achievement in a selected C.R.E. topic. The lesson plan should clearly indicate the use of mobile learning features such as digital content, assessments, multimedia resources, and learner interaction. Teachers will then present their prepared lesson plans to fellow peer teachers for discussion, feedback, and sharing of best practices in the use of mobile learning applications in C.R.E. instruction.

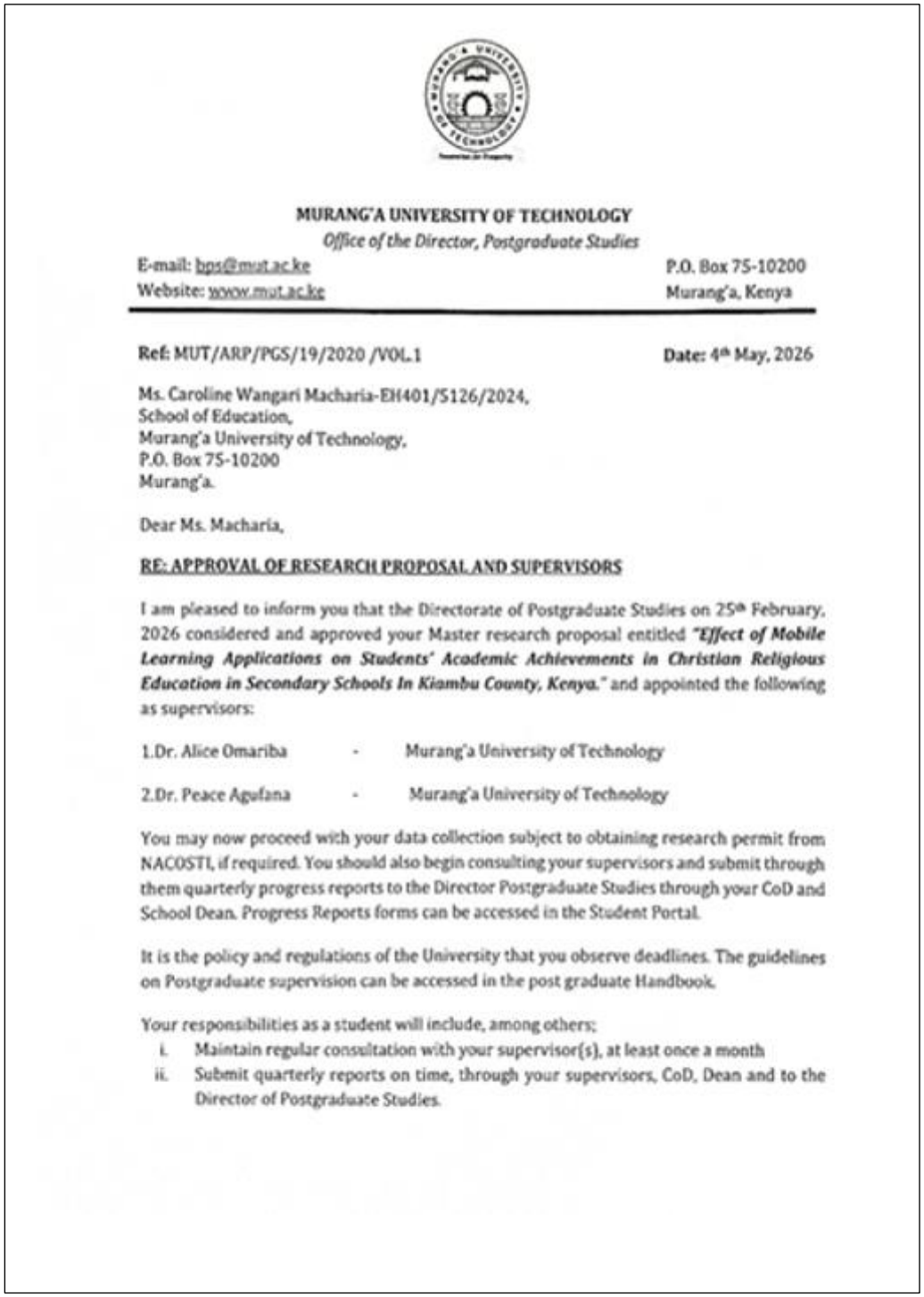
Navigation of Mobile Learning Content

Learners access lesson materials through their mobile devices. The teacher ensures that learners can successfully log in, open lesson content, and navigate different sections of the mobile learning application independently. Learners engage in structured learning activities provided through the mobile learning application. These activities may include reading digital content, watching instructional videos, listening to audio explanations, or responding to interactive tasks. The teacher facilitates learning by guiding learners, monitoring progress, and providing clarification where necessary.

Appendix 8: Map of Juja Sub-County



Appendix 9: Research Proposal Approval from Murang'a University of Technology



MURANG'A UNIVERSITY OF TECHNOLOGY

Office of the Director, Postgraduate Studies

E-mail: bps@mut.ac.ke
Website: www.mut.ac.ke

P.O. Box 75-10200
Murang'a, Kenya

Ref: MUT/ARP/PGS/19/2020 /VOL.1

Date: 4th May, 2026

Ms. Caroline Wangari Macharia-EH401/5126/2024,
School of Education,
Murang'a University of Technology,
P.O. Box 75-10200
Murang'a.

Dear Ms. Macharia,

RE: APPROVAL OF RESEARCH PROPOSAL AND SUPERVISORS

I am pleased to inform you that the Directorate of Postgraduate Studies on 25th February, 2026 considered and approved your Master research proposal entitled ***"Effect of Mobile Learning Applications on Students' Academic Achievements in Christian Religious Education in Secondary Schools In Kiambu County, Kenya."*** and appointed the following as supervisors:

1.Dr. Alice Omariba - Murang'a University of Technology

2.Dr. Peace Agufana - Murang'a University of Technology

You may now proceed with your data collection subject to obtaining research permit from NACOSTI, if required. You should also begin consulting your supervisors and submit through them quarterly progress reports to the Director Postgraduate Studies through your CoD and School Dean. Progress Reports forms can be accessed in the Student Portal.

It is the policy and regulations of the University that you observe deadlines. The guidelines on Postgraduate supervision can be accessed in the post graduate Handbook.

Your responsibilities as a student will include, among others;

i. Maintain regular consultation with your supervisor(s), at least once a month
ii. Submit quarterly reports on time, through your supervisors, CoD, Dean and to the Director of Postgraduate Studies.

iii. Ensure quality work all through.
iv. Present your research findings at 2-3 seminars/conferences prior to thesis examination.
v. Publish one article from your research findings in a refereed journal prior to thesis examination.

For any further clarification please contact the undersigned.

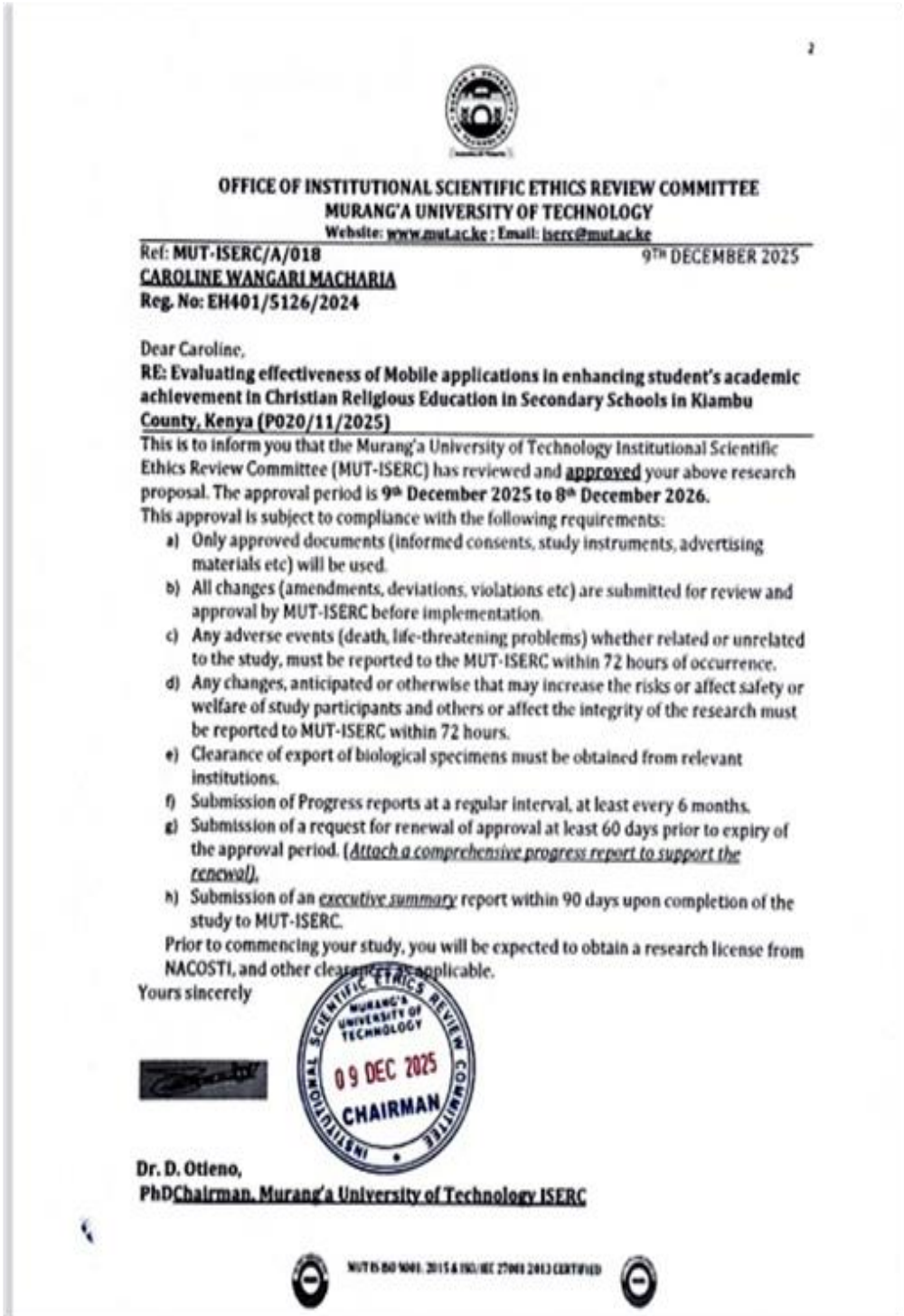
Yours Sincerely,

Prof. Geoffrey Muchiri, PhD
Director, Postgraduate Studies
CM/NOK



Copy to:
1. Registrar, Academics, Research and Students Affairs
2. Dean, School of Education

Appendix 10: Research Authorization from Murang'a University of Technology



OFFICE OF INSTITUTIONAL SCIENTIFIC ETHICS REVIEW COMMITTEE
MURANG'A UNIVERSITY OF TECHNOLOGY
Website: www.mut.ac.ke ; Email: iserc@mut.ac.ke

Ref: **MUT-ISERC/A/018** 9TH DECEMBER 2025

CAROLINE WANGARI MACHARIA
Reg. No: EH401/5126/2024

Dear Caroline,

RE: Evaluating effectiveness of Mobile applications in enhancing student's academic achievement in Christian Religious Education in Secondary Schools in Kiambu County, Kenya (P020/11/2025)

This is to inform you that the Murang'a University of Technology Institutional Scientific Ethics Review Committee (MUT-ISERC) has reviewed and **approved** your above research proposal. The approval period is **9th December 2025 to 8th December 2026.**

This approval is subject to compliance with the following requirements:

a) Only approved documents (informed consents, study instruments, advertising materials etc) will be used.
b) All changes (amendments, deviations, violations etc) are submitted for review and approval by MUT-ISERC before implementation.
c) Any adverse events (death, life-threatening problems) whether related or unrelated to the study, must be reported to the MUT-ISERC within 72 hours of occurrence.
d) Any changes, anticipated or otherwise that may increase the risks or affect safety or welfare of study participants and others or affect the integrity of the research must be reported to MUT-ISERC within 72 hours.
e) Clearance of export of biological specimens must be obtained from relevant institutions.
f) Submission of Progress reports at a regular interval, at least every 6 months.
g) Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. (*Attach a comprehensive progress report to support the renewal).*
h) Submission of an *executive summary* report within 90 days upon completion of the study to MUT-ISERC.

Prior to commencing your study, you will be expected to obtain a research license from NACOSTI, and other clearances as applicable.

Yours sincerely

INSTITUTIONAL SCIENTIFIC ETHICS REVIEW COMMITTEE
MURANG'A UNIVERSITY OF TECHNOLOGY
09 DEC 2025
CHAIRMAN

Dr. D. Otieno,
PhDChairman, Murang'a University of Technology ISERC

Appendix 11: Research Permit from NACOSTI



REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: 543924

Date of Issue: 18/December/2025

RESEARCH LICENSE

This is to Certify that Ms.. Caroline wangari Macharia of Murang'a University of Technology, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Kiambu on the topic: EVALUATING EFFECTIVENESS OF MOBILE LEARNING APPLICATIONS IN ENHANCING STUDENTS' ACADEMIC ACHIEVEMENT IN CHRISTIAN RELIGIOUS EDUCATION IN SECONDARY SCHOOLS IN KIAMBU COUNTY, KENYA. for the period ending : 18/December/2026.

License No: NACOSTI/P/25/4183080

543924

Applicant Identification Number

Ag. 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 12: Publication

This thesis has produced the following publication:

Macharia, C., Omariba, A., & Agufana, P. (2026). Accessibility of Mobile Learning Applications on Students' Academic Achievement in Christian Religious Education in Secondary Schools in Kiambu County. *East African Journal of Education Studies*, *9(2),* 656-669. https://doi.org/10.37284/eajes.9.2.5073