TEACHERS' AND STUDENTS' PERCEPTIONS TOWARDS UPTAKE OF EDUCATIONAL TECHNOLOGIES IN CHRISTIAN RELIGIOUS EDUCATION IN SECONDARY SCHOOLS IN EMBU COUNTY, KENYA

RACHAEL WANJIKU GITIHA

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DECLARATION

This thesis is my original work and has not been presented elsewhere for a degree or any other award.

Signature……. Date …….

Rachael Wanjiku Gitiha

Department of Education

E555/1370/2020

This research thesis has been submitted for examination with our approval as the University supervisors.

Signature……... Date……

Dr. Peter Rugano

Department of Education

University of Embu.

Signature……. Date……

Dr. Steve Wakhu

Department of Humanities

University of Embu.

DEDICATION

I dedicate this thesis to the most influential figures in my life, my beloved parents: my mom, Mrs. Ruth Gitiha, and my late dad, Mr. Joel Gitiha, whose invaluable influence has been instrumental in shaping the person I am today.

To my late dad, you may be gone but never forgotten. I dedicate this thesis to honor your legacy and to serve as a testament to the profound impact you have in me. Though you are no longer with us physically, your memories live on. Requiescat in pace.

To my dearest mom, you have been my pillar of strength and my source of inspiration, my confidante, and my guiding light. Your love, sacrifice, and unfaltering belief in my abilities have driven my accomplishments and sculpted the person I have become. I love you so much, Mom. God bless you and keep you.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ACRONYMS AND ABBREVIATIONS

AU	African Union
BPS	Board of Postgraduate Studies
BOM	Board of Management
CRE	Christian Religious Education
CBC	Competency-Based Curriculum
CEMASTEA	Centre for Mathematics Science Technology Education in Africa
GoK	Government of Kenya
KENET	Kenya Education Network Trust
KICD	Kenya Institute of Curriculum Development
NACOSTI	National Commission for Science, Technology, and Innovation
PU	Perceived Usefulness
PEOU	Perceived Ease of Use
SMASSE	Strengthening of Mathematics and Science in Secondary Education
SPSS	Statistical Package for Social Sciences
TSC	Teachers Service Commission
TAM	Technology Acceptance Model
UN	United Nations
WAI	Weighted Average Index
MoE	Ministry of Education

OPERATIONAL DEFINITION OF TERMS

Christian Religious Education	It is a fundamental subject taught to help learners gain moral insights to make appropriate moral decisions.
Educational technologies	These are tools developed and used for learning purposes for example laptops etc.
Instructional resources	These are materials used to supplement learning for example, audio-visual resources
New millennial learners	Students who have a greater urge for learning to learn with technology.
Perception	It is the way one thinks and understands things which eventually affects one's behavior.
Conventional methods	These are traditional, teacher-centred methods of teaching for example, use of chalk and board.
Uptake of educational technologies	Refers to the utilization of educational technologies.

ABSTRACT

Educational technologies are essential for facilitating the instructional process. Several frameworks to support their adoption have been implemented. However, integration of these technologies still lags due to perceptions from teachers and students which affects their uptake. Therefore, this study aimed to examine the correlation between teachers' and students' perceptions and the uptake of educational technologies in CRE in public secondary schools in Embu County, Kenya. A multi-stage sampling technique guided by the Technology Acceptance Model (TAM) was used to collect data from a sample of 300 students, 30 CRE teachers, and 10 principals for a descriptive cross-sectional survey study. Semi-Structured questionnaires and interviews were used to collect data which was analyzed using SPSS version 25 software. Inferential statistics, such as Pearson correlation, simple and multiple linear regression analysis, were computed alongside descriptive statistics, such as frequencies, percentages, and means. Thematic analysis was employed to obtain the measures schools implement to support uptake of educational technologies in CRE. Multiple linear regression was employed to assess factors influencing teachers' and students' perceptions. Additionally, Pearson correlation and simple linear regression analyses were conducted to analyze the correlation between teachers' and students' perceptions and the uptake of educational technologies. The Cronbach alpha reliability coefficients (α) for teachers' and students' questionnaires were 0.79 and 0.75 respectively. The results revealed that a lot of measures to support the uptake of educational technologies favored science and mathematics subjects compared to CRE. The factors influencing teachers' perceptions such as time, skills, availability of technologies, school support, adaptability to technological changes, like attitude, training, and comfort did have an influence. However, the influence was not statistically significant at (.05) level attributed to the smaller sample size which impacted the statical power. Students' factors showed that time, availability of technologies and like attitude significantly influenced their perceptions. On the contrary, skills, school and teachers' support, adaptability to technological changes and training had insignificant effects on their perceptions. Relationship between perceptions and uptake, teachers' results had an insignificant relationship (r= .142, p= .453) while students' results revealed a weak positive relationship (r=.180, p= .02). Thus, the study recommends policies to foster the integration of educational technologies in CRE in public secondary schools tailored to teachers' and students' perceptions. Lastly, in-service, and pre-service training on educational technologies for CRE teachers should be conducted to upscale their perceptions.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Educational technologies are resources that enhance learning. They include: audio-visual media, computers, internet, projectors, and smarts boards among others (Jebungei, 2017). These technologies greatly impact the way content is taught. Teachers do not have to rely on the predominantly conventional methods such as physical lectures to deliver the content. Conventional methods do not always guarantee optimal learning, because in some instances students portray rote learning and memorization (Magak, 2016 & Situma, 2016). Technology in learning yields a lot of positive outcomes. For example; more is learnt and retained than when conventional methods are used; there's good collaboration between teachers and students, student-centered learning pedagogies are introduced which improve their outcomes, curriculum innovations are facilitated and learners are prepared for the technological-based world (Marcus, 2019 & Swallow, 2017). In addition, in the 21st century, majority of students exhibit greater demand for student-centered technology-based active learning approaches (Peace, 2020).

Due to the increasing space occupied by technology in many sectors of the contemporary world, both academic and policy communities in the education sector have increasingly demonstrated interest in this space. In academia, scholars have demonstrated interest in exploring various applications of technology. In the literature, some scholars such as Salem et al. (2019) and Shpeizer (2019) have investigated the challenges associated with integrating educational technologies in the delivery of content. Faizi et al. (2015) and Teo et al. (2018) among others have focused on the perceptions of teachers, students, and other stakeholders towards their incorporation of technologies into instruction. Other scholars for example, Lai and Bower (2019) and Lemay et al. (2019) have explored the conditions under which technology is accepted, issues and concerns in curriculum development and implementation and theoretical development among others. This shows that much has not been done regarding teachers' and students' perceptions towards educational technologies.

In the world of policy and practice various policies, legislative frameworks and practical strategies aimed at facilitating application of technology in teaching and

learning have been witnessed. At the international level, United Nations (UN) acknowledges that educational technologies will be instrumental in the achievement of United Nations Charter Goals and 2030 agenda (United Nations, (UN) 2019). The African Union (AU) has promoted digitalization of the education sector by providing technological infrastructure to improve the quality and management of education (African Union, (AU) 2016). In Kenya, numerous frameworks to support the uptake of educational technologies have been implemented. In Sessional paper number 14 of 2012, the government acknowledged that technology will help in the achievement of Vision 2030 (Ministry of Education 2018). The Teachers Service Commission (TSC) Act of 2012 advocated for teachers and educational managers to effectively lead in the utilization of educational technological tools and to have all or most of the teachers trained in its integration (KICD, 2015). The National Education Sector Plan (NESP) 2013-2018 enforced technology to be injected into the curricula at all levels of learning, for the establishment of a more successful environment to ensure quality education for sustainable development (NESP, 2015).

NESP program entails activities such as the long-awaited National Laptop Program, digitalization of the curriculum, and the technological trainings by the CEMASTEA (Centre for Mathematics, Science and Technology Education in Africa). The e-government strategy is trying to maintain Kenya as an ICT hub in this globally competitive digital world. Kenya was ranked number 113 globally highlighting its ongoing efforts to integrate technology across government operations, public services, and in the education sector (Adams & Paul, 2023). Students are also being offered scholarships to enroll in educational technological-related courses in universities, this is in partnership with innovation agencies for example KENET (Kenya Education Network Trust) among others to enhance technology adaptation. Currently, the Competence-based curriculum (CBC) is advocating for the core competency of digital literacy among the learners to help them engage well with the educational technologies in class as well as in life after school (KICD, 2017).

In social science, studies done in relation to educational technologies have shown technology integration is a gradual and intricate process. Despite the global upsurge in educational technologies and the corresponding accumulation of empirical evidence supporting their effectiveness, their adoption in Kenya remains elusive, particularly in the context of Christian Religious Education (CRE) (Hassan & Aziz, 2019). The

absence or minimal application of innovative technology-based learning methods has led to the perception that CRE instruction is akin to classroom preaching (Situma, 2016). A study by Saoke et al. (2022) on CRE teachers attitudes towards instructional innovations in Meru County, Kenya reveals that educational technologies have not been sufficiently utilized in public secondary schools for the CRE subject. Furthermore, Mwai (2015) elucidates that for the successful integration of educational technologies in public secondary schools, training must commence with the school administration, as they are crucial in implementing these technologies in CRE.

Several factors in relation to the school setting have been revealed to hinder the process, but the major factor rests on the users' perceptions towards usage which remain greatly unexplored (Hartman et al., 2019). Sawyer (2017) did a correlation study on the impact of educators' views of technology use in middle schools. The research identified a notable link between their overall perceptions and the uptake of technology recommending further studies at the elementary and high school levels. A research examining the impact of user perceptions and the connection between technology integration and performance in certain Kenyan hospitals revealed that while user perceptions significantly influence technology adoption, wrong misconceptions and perceptions about these technologies hinder their uptake (Muathe et al., 2019).

1.2 Statement of the Problem

Most CRE teachers hardly use educational technologies and often prefer conventional methods. Although other reasons have been highlighted, teachers' and students' perceptions of these technologies as instructional resources have been identified to be the greatest factor affecting their uptake which has been largely overlooked and unexplored. Research has been conducted globally regarding educational technologies, yet extant literature primarily focuses on the utilization of media in teaching CRE, teaching methodologies, the teacher's role, and the effectiveness of Information Communication Technology (ICT) in the subject. Conversely, there has been limited research on perceptions towards these technologies and their relationship towards their uptake. Moreover, much has not been done locally and in relation to teaching of CRE, leaving a conceptual gap that necessitated this research.

1.3 General Objective

The general goal of this study was to examine the link between teachers' and students' perceptions and the uptake of educational technologies in teaching and learning of CRE in public secondary schools in Embu County, Kenya.

1.4 Specific Objectives

The specific objectives for this study were:

1. To establish the measures that schools implement to support teachers and students in the uptake of educational technologies in teaching and learning of CRE.
2. To determine the factors that influence teachers' and students' perceptions towards educational technologies in teaching and learning of CRE.
3. To analyze the relationship between the perceptions and the uptake of educational technologies in the teaching and learning of CRE.

1.5 Research Questions

The study aimed to address the following research questions to achieve the aforementioned objectives:

1. What measures do schools implement to support CRE teachers and students in the uptake of educational technologies in teaching and learning?
2. What factors influence teachers' and students' perceptions towards educational technologies in teaching and learning of CRE?
3. What is the relationship between perceptions and the uptake of educational technologies in the teaching and learning of CRE?

1.6 Justification of the Study

Currently, perceptions towards educational technology are the most significant area in the field of research. CRE teachers' and students' perceptions towards these technologies remain the key factors influencing their uptake. Research should be conducted to reveal the connection between their perceptions and uptake of technology. The decision to opt for public secondary schools was influenced by the fact that, as highlighted by Mwai (2015) and Ouma et al. (2013), a significant number of public secondary schools in Kenya benefit from the ESP-ICT (Economic Stimulus Program). This program facilitates the acquisition of educational technologies to enhance teaching and learning particularly in Kenyan public secondary schools as opposed to other programs such as NEPAD which primarily targets schools across the

broader African context. Embu County was selected based on the findings indicating that, despite global recognition of the importance of educational technologies in enhancing education, their effective integration into public secondary schools in Embu County is yet to be achieved (Murungi et al., 2017).

1.7 Significance of the Study

The research will contribute to understanding the significance of integrating educational technologies, consequently facilitating the training of both teachers and students in acquiring technological skills. Teachers, students, and other educators may get useful information regarding technologies, thus change their perceptions, and integrate them in the classroom, thereby enhancing the quality and performance of CRE subject. The findings will greatly benefit the University of Embu and other teacher training institutions by aiding in the enhancement of CRE teacher training programs.

1.8 Scope of the Study

The study limited itself to selected public secondary schools in Embu County. The County had 195 public secondary schools across five sub-counties: Embu East, Embu West, Embu North, Mbeere South and Mbeere North. The study's respondents were principals, CRE teachers, and form two students. The study aimed to examine the correlation between teachers' and students' perceptions and the uptake of educational technologies in CRE.

1.9 Assumptions of the Study

The researcher made the following assumptions:

1. Public secondary schools were the primary beneficiaries of educational technological initiatives thus the technologies were available, and teachers and students were familiar with them.
2. Technology has positive impact in teaching and learning of CRE, however, the perceptions towards the integration process were not known to the researcher.
3. The perception towards using a particular technology was hypothesized to be a major determinant of its usage in the TAM.
4. TAM has been used to elucidate technology-acceptance behavior in technologically developed countries. Nonetheless, there has been a dearth of studies utilizing this model in Kenya, particularly within Embu County. Therefore,

this research adds to the existing knowledge of the model and assesses its applicability within a novel setting

1.10 Limitations of the Study

Resource limitations dictated the selection of the geographical area for the study, allowing the researcher to finalize the research within the agreed-upon duration. The study was guided by the TAM, which primarily focuses on variables pertaining to behavior of technology users, which is inevitably evaluated through subjective means such as behavior intention.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter lays out a comprehensive evaluation of the related literature aligned with the objectives, the theoretical and conceptual frameworks, and the research gaps.

2.2 Schools' Measures to Support the Uptake of Educational Technologies.

Yadav et al. (2018) explains that educational technologies such as internet, interactive white boards, and projectors among others have become ubiquitous in learning. These technologies have been introduced to complement textbooks as the usual resources where schools and government have extensively supported their adoption in education (Hilton III, 2016). However, despite the support, CRE secondary school teachers have been reported to use technology less than other teachers due to barriers and perceptions exhibited at the early stages of adoption. For example, preference for conventional methods and lack of proper aspect of technological pedagogical content knowledge (TPACK) (Makgato, 2012).

Successive technology adoption highly depends on school administrators to offer training and implementation guidelines (Gray, 2001). Teachers who receive training improve their self-efficacy and become facilitators as students take a proactive role in learning. A study by Redempta and Elizabeth (2012) on the readiness of schools in the uptake of technology, show that despite the benefits associated with technologies only 10% of secondary schools render computer studies as a learning area in their curriculum. Schools with the program limit students who consider pursuing it by considering it a specialty irrespective of it being like any other subject. The study affirms that for government to leverage education as a means to transition into an e-society and guarantee quality education in the 21st century, technology must be injected into schools (Oluoch, 2016).

A research on ICT adoption in Malaysia, Lau and Sim (2008) argue that despite the availability of technologies and benefits associated with them, teachers lack skills and do not necessarily use them in teaching. Schoolnet (2013) highlights that internet and computers are the commonly used education technologies, which are used for specific reasons and sometimes in an informal way (leisure) even when available. The said

technologies are used for other purposes other than learning such as for administrative work, lesson preparations, browsing, preparing learning and reference materials, and communicating with other teachers.

Technology to be fully integrated in CRE, teacher factors as well as school factors need to be fully considered (Inan & Lowther, 2010). Teacher factors include computer proficiency, experience, beliefs, and readiness. These factors are characteristics unique to each school based on their teachers, thus consideration of supporting individual teachers to get past these barriers must be made within the school. School factors such as technological infrastructure and support influence teachers' and students' perceptions showing the indirect impacts of schools on technology integration.

Njoroge and Kibaru (2012) researched on the strategies of improving quality e-learning in Kenyan education and argued that the emphasis on implementation of educational technologies rests on teachers who are assumed to be the only key party towards change and innovation. However, the significance of the school principals in the uptake of educational technologies has been highly underestimated, yet at the school level, they should be considered among other administrators to champion the uptake process.

2.3 Factors influencing teachers' and students' perceptions towards Educational Technologies

2.3.1 Factors influencing teachers' perceptions.

Piper et al. (2015) did a study to assess the efficacy of tablets and e-readers in enhancing students' outcomes. Results showed that despite the vital role played by the said technologies, the pace of their adoption is slowed by teachers' perceptions influenced by factors such as the assumption they are complex in terms of usage, inadequate skills, and lack of self-confidence. Amuko et al. (2015) evaluated the obstacles and prospects affecting the incorporation of ICT in Mathematics within public secondary schools in Nairobi, Kenya. Employing descriptive survey research design found that, teachers' perceptions towards educational technology highly depend on school-contextual factors as well as teacher individual characteristics such as their confidence and competence which contribute to their resistance to change despite their enthusiasm. Teachers' neutral or negative attitudes are influenced by the

said factors and thus end up making illogical decisions regarding technology (Karkouti, 2021).

There seems to be a slight difference among teachers, not only in their technological skills and perceptions but also in the factors that influence their perceptions. Katemba (2020) on teachers' perception in implementing technologies in language in Bandung Indonesia explained that most of the teachers have positive perceptions towards technology. Their demographic characteristics do not limit them from using it. At different ages, technology makes their work easier and learning interesting. Moreover, they argue technology cannot replace them as it cannot act as a role model to students and comfort them when sad.

Kitari (2020) and Schoolnet (2013) argue that teachers can have positive attitudes towards education technologies, be familiar with them, be skilled, and innovative but still make no effort to integrate them in learning. Intrinsic forces such as self-efficacy influence their perceptions towards usage. Manduku et al. (2012) focusing on utilization of ICT in public secondary schools in Uasin Gishu explains that successful integration will only be possible if the perceptions are addressed through training of teachers. Teo et al. (2018) used TAM variables Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) to analyze the factors impacting the intention to utilize technology in China. Findings showed that, defiance towards its usage despite availability is highly influenced by teachers' perceptions. Similarly, using TAM and Diffusion of Innovation theory to identify the predictors of ICT implementation, Kiptoo (2019) uncovers that teachers' reluctance stems from the belief that technology may jeopardize their employment prospects, given its perceived advantages as a mode of e-learning delivery.

Tou et al. (2020) researched on teachers' attitudes towards ICT in Singapore. Comparing 422 Singapore physical education teachers using descriptive design across different demographic factors found that, teaching experience can highly influence technology uptake. Moreover, Andoh (2012) on determinants of technology adoption in Ghana explains that personal, institutional, school level, technological, and systemic factors influence perceptions towards educational technology. Personal factors include educational experience and computer literacy. The research further explains that these factors more so teachers' factors such as experience make technology take a back seat for conventional methods to dominate.

2.3.2 Factors Influencing Students' Perceptions

Maphosa (2021) and Wijaya and Weinhandl (2022) researched on factors influencing students' perceptions towards technology in Zimbabwe and Switzerland, respectively. Employing the Unified Theory of Acceptance and Use of Technology (UTAUT), an extension of TAM explained that perceived ease of use, effort and performance expectancy, hedonic motivation, social influence and facilitating conditions such as resources and support have a direct impact on students' perceptions towards education technologies which determine their actual usage. Students' preference for certain technologies is directly affected by factors influencing their perception towards their usefulness. They will only perceive technology to be useful if it is user-friendly (Bourgonjon et al., 2010).

A study in Indonesia on students' perceptions of online learning in EFL classroom, Cakrawati (2017) highlights that students being new millennial learners perceive technology positively, because it helps them learn outside the classroom, do assignments anywhere anytime and it is more efficient than textbooks in accessing learning materials. Similarly, in the Edmodo technological classroom, research shows that, the new millennials develop positive attitudes due to factors like it is not boring when learning with it rather it is interesting and improves their learning outcomes (Mustafa, 2015).

A conference proceeding at the University of Sofia in Bulgaria Europe, evaluated students' attitudes towards online learning. From the survey, it was noted that students experience with the technology, possessing requisite technological skills played a crucial role in influencing their perceptions towards education technology and its usage (Peytcheva-Forsyth et al., 2018). On the contrary, Seddon and Biasutti (2009) and Selim (2003) argue that students' perceptions towards education technologies have been often overlooked in the adoption process for the longest time which can affect the uptake process.

Though technology tends to pose both constructive and destructive effects to both teachers and students. They will regard the positive effects of the technology than the negative. Students will tend to like technologies because of the benefit that comes with them for example assessing assignments, sending and receiving emails, net surfing, downloading files, and assessing social networks (Gorra & Bhati, 2016). Moreover,

familiarity with the educational technologies helps to determine the students' perceptions. Popovici and Mironov (2015) exploring students' perception in e-learning classes say that students who are more familiar with technologies and able to navigate through the rapid technological advancements, are always positive and usually show greater urge for technology.

Students being in a technologically saturated environment is not a guarantee they are all willing to be digital learners. Certain factors such as technology experience and acceptance, individual learning styles and perception of the subject predict their acceptance of technology (Keller & Cernerud, 2002). Though students' demographic factors influence their perception, other predictors such as their performance and effort expectancy, and social influence factors should not be ignored as they also have a notable impact on their perceptions and intentions for technology utilization (Perera & Abeysekera, 2022).

In Malaysia, Ting (2013) explored students' perceptions using a video project indicating that, students generally have positive perceptions about technology but show hesitations due to lack of skills. Williamson and Muckle (2018) adds that factors such as students' skills, desires, and adaptability reflect their readiness and capacity to participate in its usage. Majority of the students will accept certain technologies but only a few will continue using them. A study on students' perceptions in a physics flipped classroom revealed that, there are both negative and positive implication of technology to students (Musdi et al., 2019). Students will perceive technology positively only if it suits them. For example, communicating and accessing information via the internet. However, TAM's components PU and PEOU show that the perception of usefulness and its importance in learning are the main factors towards technology initial adoption (Lust et al., 2012).

2.4 The relationship between the perception and the uptake of technologies

Park et al. (2022) explain that the perception aspect of technology should not be disregarded, because it has a very crucial effect on technology acceptance and usage. Research on technology adoption has shown that, individuals generally oppose change unless they formulate an attitude toward utilizing technology, which depends on their perception. There seems to be a notable positive connection between perceived ease of use and perceived usefulness, which in turn influences attitudes and perceptions

towards usage. Perceived ease of use and perceived usefulness drives personal technological motivation (Tenakwah et al., 2022).

Textual analysis of comments in an online survey to explore perception and technology usage, showed that people portray different perceptions regarding technology usage. They tend to be either optimistic, excited or fearful about technology (Cui & Wu 2021). There is a clear connection between perception and technology usage and studies show that little has been done to examine this relationship more so in CRE (Hussein, 2017). To investigate older adults' perception and barriers to interact with tablets and other technology, Vaportzis et al. (2017) revealed that most people are eager and willing to adopt technology. However, older adults are slower to adopt technology compared to young and new millennial learners. The old will perceive using technology if it is of value to them. Understanding the different perceptions that people have while using technology is important as this influences their decisions towards its usage.

In his thesis, Gardner (2017) investigated the consequences and factors affecting perceptions and usage of technology using TAM. He found out that people have different perceptions towards technology and the majority are unwilling to embrace technology more so the wallet phone, among others. The research proposed that when implementing any technology, perceptions should be considered. Sawyer (2017) in a study on perception and practice found out that the majority of the teachers are experienced technology users but do not integrate technology effectively due to different perceptions which explains if they will finally use technology or not. From the study only 80% of the teachers use technology in less than half of their time, 47% encounter difficulties with the equipment, 30% mentioned time constraints, 23% pointed out students' skill levels, and 17% highlighted their own skill levels.

In his theory, *Diffusion of Innovations* on how technological innovations move from one stage to another published in 1995, currently in its fifth edition Rogers (2003) explains that for technology to be acceptable, reach adoption stage and be used, the conditions for acceptance among the social group must be considered. The technology-enabled classroom should be situated well within the ecological systems of the school and the teachers, students, and other administrators' perceptions and opinions considered and taken care of.

Research on predictors of perceived and actual technology usage argues that there is need for integrative study to better analyze the individual differences concerning technology acceptance and usage. The findings indicate that personality differences, previously overlooked, have now garnered heightened scholarly attention and interest in the broad field of technology utilization (Barnett et al., 2015). The decision to use technology is influenced by intrinsic as well as extrinsic factors. Intrinsic factors include personal beliefs and intentions regarding technology while extrinsic factors include access, time, and support, among others. Additionally, Hartman et al. (2019) elucidates that the major factor rests on the users' perceptions towards usage which remain greatly unexplored have been revealed to hinder the process. A correlation study on the impact of educators' views of technology use, identified a notable link between perceptions and the uptake of technology recommending further studies at other school levels (Sawyer, 2017). Furthermore, Muathe et al. (2019) explains that while perceptions significantly influence technology adoption, negative perceptions hinder the uptake process.

2.5 Theoretical Framework

The Technology Acceptance Model (TAM) (Davis, 1986) informed the study. The model attempts to understand, forecast and describe factors influencing individual behavior regarding any Information Communication Technologies (Davis, 1989). It relies on two principles, Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) which predicts an individual's attitudes concerning technology acceptance. PU is the degree to which a person feels that utilizing a specific system will improve their ability to perform their work. PEOU is the degree to which a person feels that utilizing a specific system would be effortless. Integration, acceptance, and the success of any technology mainly depend on PU and PEOU. The following diagram shows how TAM works. The study sought to determine the association between teachers' and students' perceptions and the uptake of educational technologies in CRE

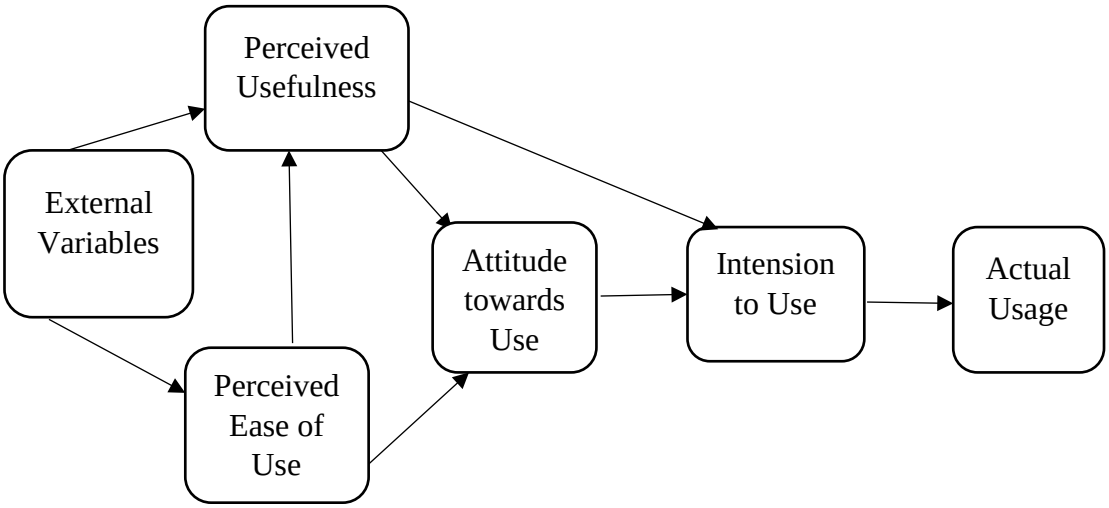

Figure 2.1 The Original TAM by Fred Davis 1986

This model shows how various elements interconnect to forecast whether people will use technology. The external variables directly affect the PU and PEOU (Venkatesh et al., 2003). PU is directly affected by POEU, and together these two variables collectively shape a person's attitudes toward a certain technology (Davis, 1989). Attitudes towards using technology and PU of that technology influences individual behavioral intentions towards usage, and in turn the intentions predict if an individual will use that technology.

Table 2.1: Summary of TAM Components

Components	Description
External Variables	Factors not explicitly outlined in the model but directly affect PU and PEOU**.**
Perceived Usefulness	The extent to which a person perceives that utilizing a certain technology strengthens their performance.
Perceived Ease of Use	The level in which a person perceives that utilizing a certain technology would free them from effort
Attitudes	Feelings that promote or prevent an individual from using technology**.**
Behavioral Intentions	The level to which a person is enthusiastic to carry out a duty using technology

Technology will not be deemed useful if it is not easy to utilize. It is observed that most CRE teachers and students may experience difficulties in technology usage thus causing dissatisfaction whether to use it or not. At this point, the PU and PEOU are affected by attitudes and perceptions which influence the technology uptake. If they

perceive technology to be good, they will show positive perceptions which influences their behavior and usage. External variables influence perceptions, beliefs, and intentions. From the literature review, the external variables impacting PU and PEOU, which subsequently influence perceptions include computer self-efficacy, institutional factors such as school support, individual factors, and technology relevance, among others. Therefore, the study aimed to ascertain these perceptions that shape teachers' and students' behavior towards technology acceptance, in order establish the nexus between their perceptions and uptake of technology. TAM was the most appropriate model to determine these perceptions towards technology which has become the most important subject in education and the world of research (Venkatesh et al., 2003)

2.6 Conceptual Framework

Teachers' and students' perception constitute the independent variable, whereas the uptake of educational technologies serves as the dependent variable. Both CRE teachers' and students' perceptions have a direct influence on how they perceive technology usage (whether useful or not). The connection between independent and dependent variables may be impacted by the intervening variables (Kothari, 2004). From this study, the intervening variable includes skills, intention to utilize technology, psychological readiness, and perceived technological interest, among others. In this study, the framework was adopted from TAM to establish the nexus between teachers' and students' perceptions and uptake of education technology in public secondary schools in Embu County, Kenya.

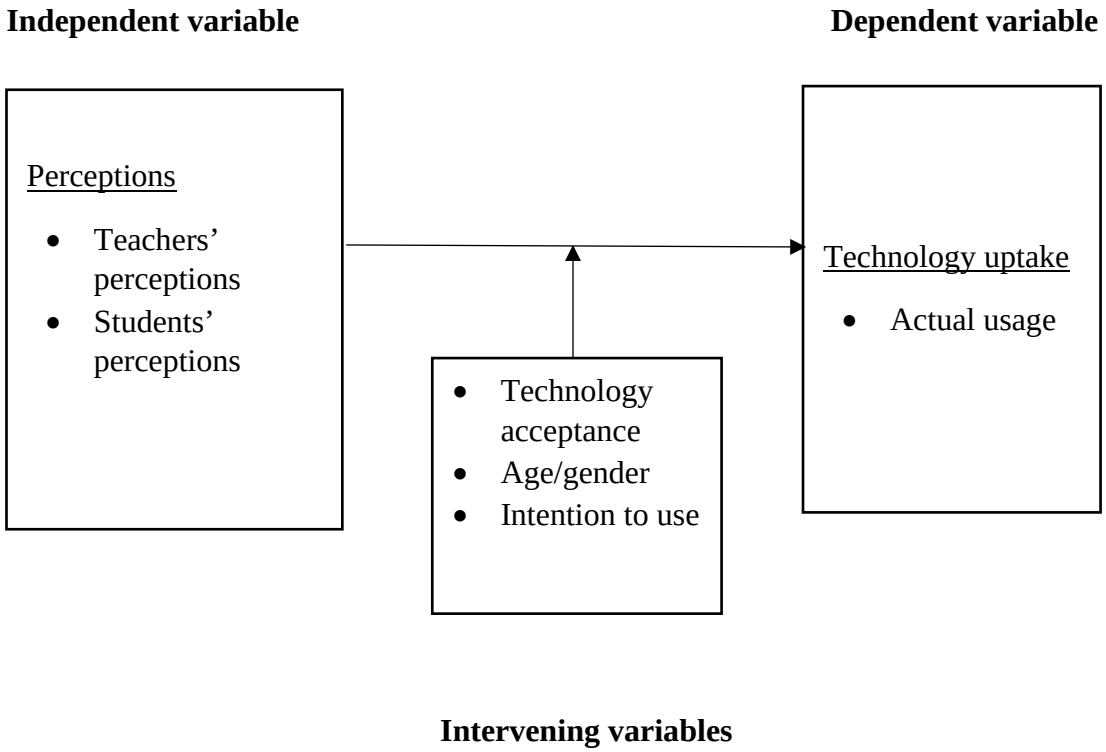

Figure 2.2: Conceptual Framework

2.7 Summary of the Empirical Literature and Research Gaps

Educational technologies are regarded as paramount and effective instructional resources for enhancing student-centered learning pedagogies (Murundu et al., 2017; Situma, 2016). However, despite the global proliferation of educational technologies and the accumulation of empirical evidence demonstrating their efficacy, their uptake in Kenyan public secondary schools remains elusive, particularly in the context of CRE (Hassan & Aziz, 2019; Saoke et al., 2022). Piper et al. (2015) showed that, the pace of technology adoption is slowed down by the teachers' and students' perceptions yet CRE needs to be taught using appropriate technological methods and resources not only the predominantly conventional methods to meet the 21st century technological learning demands. Manduku et al. (2012) and Park et al. (2022) explained that for educational technologies to be fully acceptable, reach the adoption stage, and be fully used, users' perceptions should be addressed, and not overlooked because they have a very significant impact on acceptance and usage. Additionally, studies show that there is scanty literature on the relationship between user's perceptions and the uptake of educational technologies more so in Kenya and particularly CRE. Therefore, this research was undertaken to address the gaps in CRE.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter discusses the design, location, study population, sampling procedures and sample size, research instruments, validity and reliability of the research instruments data collection procedures and data analysis.

3.2 Research Design

The study employed a descriptive cross-sectional survey research design. The research is descriptive when it explains the nature of the relationship between variables to provide answers to what, how, and why questions (Kothari, 2004). Furthermore, the design serves to identify and document the current state of affairs, such as potential behaviors, attitudes, values, and characteristics exhibited by the participants (Kimosop, 2019; Nyamwaya et al., 2020). Therefore, the selection of this study's design was facilitated by the nature of the research problem.

3.3 Location of the Study

The research was carried out in Embu County, Kenya. The County lies 120 kilometers North-East of Nairobi and South-Eastern side of Mt. Kenya. Covering an area of 2,818 square kilometers, the region has a population of 516,212, consisting of 49% males and 51% females (Embu, 2014). It borders Tharaka Nithi to the North, Kitui to the East, Machakos to the South, Murang'a to the South-West and Kirinyaga to the West. During the study, the region had 195 public secondary schools across five Sub-Counties, namely: Embu East, Embu West, Embu North, Mbeere North and South. The study was conducted in Embu East and Mbeere North Sub-counties, which were randomly selected.

3.4 Target Population

A population is what researchers universally recognize, define, and quantify (Asiamah et al., 2017). The targeted population was the school principals, CRE teachers, and form two students. The study focused on public secondary schools in Embu County, which comprised a total of 195 schools, 630 CRE teachers, and 14,585 form two students *(County Director of Education, Embu).* Incorporating school principals aimed to provide insights into school policies and measures related to the uptake of

educational technologies. Form two students were chosen because form one students had not been in school for a significant duration compared to form two students. Form three students had a limited target population as CRE was an elective subject in some schools. Form four students were excluded as they were preparing for their National Examinations.

3.5 Sampling Procedures and Sample Size

Sampling entails selecting a subset to represent the entire population in the study (Creswell & Creswell, 2017). Probability sampling strategy, specifically a multistage random cluster sampling technique was employed. Public secondary schools served as the sampling unit, with a sampling frame comprising 195 schools drawn from five sub-counties (clusters): Embu East, Embu West, Embu North, Mbeere North, and Mbeere South. Mugenda and Mugenda (2003) explains that 10-50% of the sample is applicable for research. For this reason, a sample size of 15% was taken from the 195 schools giving approximately 30 schools which yielded an adequate sample size. The 30 schools were drawn by proportionate sampling technique from 2 out 5 randomly selected Sub-Counties, that is Embu East and Mbeere North, with 44 and 46 public secondary schools, respectively.

The proportionate technique was adopted to ensure that all the schools in the selected clusters had a chance to engage in the research. Proportionate technique involves determining the number of participants from each sub-group based on their proportion to the entire population (Kothari, 2004). From the 30 schools, 25% of form two students (10 out of 40) were randomly chosen for the study. Wanjala et al. (2017) explains that a smaller sample size is sufficient for homogenous population to obtain the required level of precision. Additionally, five principals from each Sub- County were also randomly chosen for the study. Therefore, the total sample size included 10 principals, 30 CRE teachers and 300 students.

Table 3.1: Sample Size Determination

	Population	Sampling Technique	Sample
Sub- Counties	5	Random	2
Public Schools	195	15%	30
Schools per Sub-County	44	Proportionate	15
• Embu East	46	Proportionate	15
• Mbeere-North			
Principals	30	Random	**10**
Teachers	30	All	**30**
Students	1200	25% of 40	**300**

3.6 Research Instruments

Research instruments are tools used for data collection in a study (Creswell & Creswell, 2017). Interview guides for the principals and questionnaires for CRE teachers and students were employed to gather data. The questionnaires contained both open and close-ended questions. The principals' interviews gave information on the measures schools implement to support uptake of educational technologies in CRE while the questionnaires examined teachers' and students' perceptions towards educational technologies.

3.7 Validity of the Research Instruments.

Research instruments are considered valid when they result in logical and meaningful conclusions in alignment with the identified research gap (Creswell & Creswell, 2017). Validity, according to Mohajan (2017), pertains to the level in which a test accurately assesses its ideal construct, enabling proper interpretation of results. The content and face validity of the instruments underwent scrutiny by research supervisors and experts from the Department of Education at the University of Embu. The instruments were thoroughly examined and critiqued, identifying areas that required adjustments. Additionally, certain shortcomings were identified where several constructs that were negatively framed were rephrased positively in order to gather the intended data. According to Khabour and Hassanein (2021) the validation of the study questionnaire

relies on scrutiny by research supervisors and field specialists which aims to enhance the refinement of the questionnaires.

3.8 Reliability of the Research Instruments

Reliability is the range in which research instruments give accurate and consistent results over several times (Singh, 2017). To verify the reliability of the instruments, a pilot study was conducted. Piloting research instruments help eliminate misinterpretation, misconception, and doubt in the research items. The pilot study allowed the researcher to gauge the wording, difficulty, and overall appropriateness of the questions to the respondents. After expert guidance from the supervisors, adjustments were made to the questionnaires. A pilot test was conducted in Embu West Sub-County to further test the instruments. Ahmed and Ishtiaq (2021) argue that the evaluation of methodology for high-quality research heavily emphasizes the crucial significance of validity and reliability. Furthermore, questionnaire items' reliability was analyzed applying Cronbach's alpha formula (Singh, 2017; Tuan et al., 2022). The reliability formula is depicted in equation (1) below.

$$\propto = K.c/[v + (K-1)c]$$

In which:

K denotes the number of items in the assessment instrument

c is the average inter-item covariance among the items

v is the total mean-variance

The reliability coefficient of the teachers' and students' questionnaires yielded scores of 0.79 and 0.75 respectively. According to Taber (2017), in Social Sciences, a Cronbach alpha reliability coefficient (α) of 0.7 or higher is considered appropriate. To increase the reliability factor, all questionnaire items that were negatively worded were positively re-worded to cater to respondents' education levels and eliminate any ambiguities. Blasberg et al. (2016) explained that it is important to re-word statements to avoid ambiguities and uncertainties.

3.9 Piloting

A pilot study holds significance in research because it evaluates whether the wording and format of the questions might present challenges to the respondents. Before any

research, a pilot test should be performed to pinpoint any vagueness and uncertainties within the research instrument (Ismail et al., 2017; Zohrabi, 2013). Johanson and Brooks (2009) suggests that, in research, 10% of the sample should be considered for the pilot study. Therefore, from a sample of 10 principals, 30 CRE teachers, and 300 students, only 10% of the respondents who were not part of the study were used for a pilot study from three randomly selected public secondary schools in Embu West Sub-County. Hence, one principal, three CRE teachers and 30 form two students were used for pilot study. Following this, the questionnaire items were adjusted appropriately for actual data collection. Embu West was selected as the piloting Sub-County due to the similarity in school characteristics to those in Embu East and Mbeere North, where the main research was conducted.

3.10 Data Collection Procedure

The researcher adhered to the ethical regulations put in place by the Board of Postgraduate Studies at the University of Embu, where approval to conduct the research was issued. In addition, the process included a thorough review of research ethics and approval from the National Commission for Science, Technology, and Innovation (NACOSTI) of the Ministry of Higher Education before data collection. As part of the process, a research approval license NO: NACOSTI/P/23/23007, was successfully applied for and obtained. To gain access to Embu County public schools, teachers and students, consent, and authorization from the office of the County Director of Education in the Ministry of Education, State Department of Early Learning and Basic Education, Embu County was sought. As a result, the study was further reviewed, and permission was granted with the authorization letter Ref: EBC/GA/32/1/Vol. V/91. For the selected schools, consent was granted by school principals during the research period.

3.11 Data Processing and Analysis

Qualitative and quantitative data from the research tools were first checked for comprehensiveness. Furthermore, the data was studied, modified, directly coded, tabulated, and analyzed using SPSS version 25 software. In research, steps such as coding, integration, interpretation, comparison and triangulation should be carried out during data analysis (Atmowardoyo, 2018). Descriptive statistics such as means, standard deviations, frequencies, and percentages as well as inferential statistics such as correlation and regression analysis were used to analyse the data. In the first

objective, data was obtained from principals' interview guides. Direct quotations were thematically coded to establish measures schools implement to support uptake of educational technologies in CRE. In the second objective, factors that influence teachers' and students' perceptions towards educational technologies, data was obtained from both teachers' and students' questionnaires. To rank the perceptions and the factors that influence teachers' and students' perceptions of educational technologies, researchers computed the Weighted Average Index (WAI). The study adopted research by (Saoke et al., 2022, 2023) as shown in equation (2).

$$WAI = \frac{\sum sd + d + un + a + sa}{N}$$

In which:

- WAI stands for the weighted average index
- sd stands for strongly disagree
- d denotes disagree.
- un denotes undecided
- a denotes agree.
- sa denotes strongly agree.

Prior to regression analysis, plausibility of the data were first checked. The independent variables in this objective were subjected to correlation and multicollinearity trials, tolerance (1/VIF), and variance inflation factor (VIF) to further determine if the independent variables were related (Akinwande et al., 2015; Daoud, 2018; Saptono et al., 2021). The variance inflation factor is calculated as shown in equation (3)

$$VIF = {}^{1}/_{1 - R^2} = {}^{1}/_{Tolerance}$$

Where:

- VIF is the variance inflation factor.
- R^2 is the coefficient of variation.
- Tolerance is simply the inverse of VIF.

several explanatory variables required a statistical approach to describe the multiple association between these variables with a single continuous outcome. Notably, the

perceptions towards educational technologies could differ due to different factors such time availability, skills, workshops/training, rapid technological changes, and availability of educational technologies, among others. Therefore, the primary model for analysis for this objective was multiple regression analysis to ascertain factors influencing perceptions of educational technologies among the teachers and the students. According to Alshammari et al. (2022), Hanley (2016), Mahaboob et al. (2020) and Nzomo et al. (2023), compared to other models, multiple regression analysis was more appropriate since it evaluated the independent variables simultaneously instead of separately. The following illustrates the multivariate regression modeling equation (4).

$$Y = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + B_5X_5 + B_6X_6 + B_7X_7 + B_8X_8 + \mu$$

In the equation, Y represents perceptions, B0 is the intercept, and B1, B2, B3, B4, B5, B6, B7 and B8 are the regression coefficients corresponding to the independent variables. X1 denotes time, X2 denotes skills, X3 denotes technological resources, X4 denotes school support, X5 denotes rapid technological changes, X6 denotes like-attitude, X7 denotes training and workshops, X8 denotes confidence and comfortability and μ represents the error term.

The association between teachers' and students' perceptions and the uptake of educational technologies was analyzed in objective three. The data was gathered using both teachers' and students' questionnaires. Pearson correlation moment was employed to analyze the data followed by simple regression analysis. Both correlation and simple linear regression were executed to ascertain whether a linear association existed between the dependent and independent variables. Models such as System Generalized Methods of Moments (GMM) and Panel Vector autoregression (VAR) are typically employed to examine the relationships among variables. However, in this objective, there was a dependent variable (uptake of educational technologies) and a solitary independent variable (teachers' and students' perceptions). Consequently, this necessitated a statistical approach to examine and characterize the relationship between these two variables. Therefore, the primary analytical model employed was simple linear regression analysis, which was used to examine and quantify the nature of the association between dependent and independent variables in the students' data. For the teachers' data only a correlation analysis was conducted which revealed there

was no correlation between teachers' perceptions and uptake of educational technologies. The regression model for students' data in this objective is shown in equation (2).

$$Y = B_0 + B_1X_1 + \mu$$

Where Y represents the dependent variable (uptake of educational technologies), B_0 is the intercept/constant, B_1 is the regression coefficient of X_1 (independent variable), X_1 is the independent variable (students' perceptions), and μ represents the error term, which includes random variabilities that are not considered in the model.

3.12 Logical and Ethical Consideration

The study was conducted conforming to the ethical research standards. Participants were informed that the study solely served academic purposes and that their participation was voluntary. Permission was obtained from the principals to collect the data. To safeguard participants' anonymity and confidentiality across data collection, analysis, and interpretation phases, personal details and names were withheld, disclosing only pertinent demographic information. To enhance data protection, the researcher saved the data in Google Drive to be made available on request in adherence to research obligations which was only accessible to the researcher. In addition, the data was shared with the research supervisors only via their corporate emails with passwords to ensure data safety and security. The researcher used pseudonyms instead of the participant's and school's actual names for anonymity purposes to protect their identities. Interviews were conducted in principals' offices for purposes of privacy, and confidentiality, and to conceal the information from reaching unauthorized people. The interview's direct quotations were further presented using random codes and participant's pseudonyms. The researcher also received all the necessary authorization documents from the National Commission for Science, Technology, and Innovation (NACOSTI), the County Director of Education, Embu County, and the Board of Post Graduate Studies, university of Embu to conduct the study. Additionally, other writer's publications and scholarly work used were highly acknowledged and cited.

CHAPTER FOUR

RESEARCH FINDINGS AND DISCUSSIONS

4.1 Introduction

The study's findings and discussions are presented in this chapter. It is organized per the study's objectives. The study first examines principals', teachers', and students' response rates, demographic details, and the study findings. The first objective was to establish the measures schools, implement to support CRE teachers and students in the uptake of educational technologies. The second objective was to determine the factors influencing teachers' and students' perceptions towards educational technologies and the third objective was to analyze the association between the perceptions and the uptake of educational technologies in teaching and learning of CRE.

4.2 Response Rate

The return rate for all research instruments was 100%. The response rate was suitable for enhancing the credibility of the research data. The high response rate can be ascribed to researcher personally approaching the consented participants and using a drop-and-pick method for the questionnaires, minimizing the potential for non-response bias. In total, 10 interviews, 30 CRE teachers' and 300 students' questionnaires were utilized for the analysis.

4.3 Background Information of the Participants

Data on the demographic characteristics of the principals, teachers, and students including their gender, age, academic qualifications, teaching experience, qualification, subjects taught, and years of service were collected. Analyzing participants' background helps to acquire a deeper comprehension of the study's demographic context. As suggested by Ray (2020), understanding participants' demographic information is crucial for comprehending their characteristics, and laying the groundwork for a comprehensive, inclusive, and relevant discussion in line with the study objectives. Results on background information for the principals, teachers and students are presented in tables 4.1, 4.2, and 4.3, respectively.

4.3.1 Principal's Demographic Information

Table 4.1: Principals' demographic information

Participants	Variable	Description	Frequency	(%)
Principals (N=10)	Gender	Male	5	50%
		Female	5	50%
	Age	41-50 years	1	10%
		51-60 years	9	90%
	Experience	21-25 years	4	40%
		Above 25 years	6	60%
	Serving as principal	1-5 years	6	60%
		6-10 years	2	20%
		11-15 years	1	10%
		16-20 years	1	10%
	Qualification	Bachelors	6	60%
		Master's degree	3	30%
		PhD	1	10%
	Teaching subject	Sciences	5	50%
		Humanities	4	40%
		Technical	1	10%

The gender of principals in the sample was an equal distribution, with 50% being male and 50% female, highlighting a balanced representation in school leadership. Regarding age, a minority of 1(10%) fell within the 41-50 years range, while the majority, 9(90%), were between 51-60 years. The majority of principals, 6(60%), had a teaching experience of over 25 years, while the minority, 4(40%), had experience ranging from 21-25 years. This showed they were well experienced, positioning them as adept advocates for technology integration in school. Regarding years served as principals, 8(80%) had a service tenure between 1-10 years, while 2(20%) had served for a duration of 11-20 years. In terms of qualifications, 1(10%) held a PhD, 3(30%) possessed a master's degree, and 6(60%) had a bachelor's degree.

4.3. 2 Teachers' Demographic Information

Table 4.2: Teachers' demographic information

Participants	Variable	Description	Frequency	(%)
Teachers	Gender	Male	7	23%
(N=30)		Female	23	77%
	Age	Below 30 years	12	40%
		31-40 years	8	27%
		41-50 years	3	10%
		Above 50 years	7	23%
	Experience	Less than 1 year	1	3%
		1-5 years	12	40%
		6-10 years	8	27%
		Above 20 years	9	30%
	Qualification	Diploma	2	7%
		Bachelors	24	80%
		Master's degree	4	13%

The sample characteristics, which showed that 23 (77%) of the participants were female and 7 (23%) were male, supported the perception that females predominate in CRE. The results are consistent with the observations made by Saoke et al. (2022), indicating that majority of CRE teachers in secondary schools are female. Regarding age, 12 (40%) were below 30 years, 8 (26.7%) were between 31-40 years, 3 (10%) were between 41-50 years, and 7 (23.3%) were above 50 years. The results indicate that most of the CRE teachers are 31 years and above. In terms of experience, the majority of the teachers, (70%) have a teaching experience of 10 years and below, while the minority (30%) have more than 20 years of experience. This implies that, CRE teachers can impact the integration of educational technologies and students' learning outcomes in schools. Experience emerges as a potent factor positively affecting the integration of educational innovations in CRE (Gore et al., 2017). Regarding qualification, 24(80%) of the teachers held a bachelor's degree, 4(13%) held a master's degree, and 2(7%) had a diploma. This indicated that all the teachers met the minimum qualification to instruct CRE. This aligns well with entry

qualifications for teachers, which specify that a diploma from an accredited educational institution is the minimum qualification required by the Teachers Service Commission for teaching CRE in secondary schools (Alanazi, 2019). Similarly, the results aligned with those of Nyankanga et al. (2013) that a significant proportion of CRE teachers in Kenyan secondary schools hold a bachelor's degree.

4.3.3 Students' Demographic Information

Table 4.3: Students' demographic information

Participants	Variable	Description	Frequency	(%)
Students	Gender	Male	125	42%
(N=300)		Female	175	58%
	Age	14-15 years	63	21%
		16-17 years	120	40%
		17 years and above	117	39%

The finding concerning gender revealed that most of the students in CRE were female, comprising 58% of the total (Table 4.3). This corresponds with earlier results by Munyao et al. (2017), which similarly noted that CRE tends to be perceived as a subject dominated by female students. Regarding students' ages, the data indicated that a significant proportion, 237 students (79%), were aged 16 and above, while 63 students (21%) fell between the ages of 14 and 15. According to ministerial policy in Kenya, the average age of form two students should typically range between 15 and 16 years. However, a considerable number of students surpassed this age bracket, which was attributed to persistent challenges such as poverty, heightened dropout rates, and repetition, as highlighted in reports by the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the International Ministry of Education in Kenya. These challenges hinder the smooth progression of formal education, particularly in rural and marginalized regions, including one of the sub-counties examined in the study (Ministry of Education, 2001; Sabates et al., 2011). Furthermore, this age discrepancy was also linked to the government's implementation of a 100% transition rate policy, mandating universal enrolment of all Kenyan children in primary and secondary school basic education. This policy aims to combat illiteracy,

increase access to education, uphold constitutional rights to education, and align with the Vision 2030 Agenda (Otieno & Ochieng, 2020).

4.4 Measures Schools Implement to Support the Uptake of Educational Technologies in CRE.

Data was collected via interviews with school principals, producing qualitative data that was structured and grouped for effective interpretation. Codes were assigned to responses, facilitating the identification of recurring patterns and themes resulting in insightful conclusions and suggestions. The study found several measures like training of school principals as gate keepers for the integration process, discriminatory teacher professional development, unclear school policy on incentives, inadequate educational technologies, denial of access to educational technologies and limited motivation measures. The measures extracted from the responses are discussed as follows:

4.4.1 Training principals as gate keepers for integration

In the interview, principals were questioned about their training in educational technologies and the advantages they gained from it. All the ten principals (100%) confirmed receiving training, and one of them expressed the following sentiments:

> "I have had several trainings with SMASSE which helped me to integrate these technologies, in my physics class. I use my laptop and projector to teach" (Informant 2, 2023).

According to the National ICT policy, school principals play a pivotal role as key implementers of technologies in CRE and are mandated to undergo training to facilitate teacher capacity development (Mwai, 2015). Gray (2001) elucidates that for the success of any educational technologies, training should commence with the school administration to guide teachers and students. This is because, if the school administration falters in implementing and adopting educational technologies in their operations, they will be unable to effectively lead in its classroom usage. The study showed that all the principals underwent training and acknowledged the importance of technology.

4.4.2 Discriminatory Teacher Professional Development (TPD)

The principals were queried about the availability of workshops or training sessions on the integration technology for CRE teachers. According to the principals, both internal and external workshops on educational technologies were available.

However**,** owing to the perceived complexity of science and mathematics subjects compared to CRE, their subject teachers opted to attend these workshops. One of the principals made the following report:

> "We always have external-based workshops like now we are having an ongoing one at the County level. These workshops are always meant for all teachers but hardly do CRE teachers attend, they are mostly attended by our science and mathematics teachers as the subjects are a bit complex. For CRE none has ever happened, and we have never thought of it" (Informant 2, 2023).

According to Jebungei (2017) teachers are key to the integration and orchestration of educational technologies, significantly influencing how students perceive and utilize them. The success of education-based technology in CRE hinges on teachers' pre-conceptions, their experience, mentorship, support measures provided by the school, and ongoing training or professional development. This underscores that teacher training is equally vital alongside the purpose of school principals in the uptake of educational technologies. The findings align with the assertions of Omariba (2016) and Wood et al. (2005), emphasizing the strong connection between teachers' perceptions and their training in the utilization of educational technologies. Consequently, addressing perceptions requires sustained and ongoing training. However, due to the discriminatory TPD which favored science and mathematics at the expense of CRE, a considerable number of teachers refrain from using educational technologies. This was reflected in the teacher questionnaire results where the majority (73%) indicated they had never received training, 17% mentioned receiving training once a year, and 10% reported being trained once a term.

4.4.3 Unclear School Policy on Incentives

In the interview, the principals were inquired about government collaboration with the school to support the implementation of educational technologies. The responses revealed that 40% of the schools' faced challenges in securing funds for purchases, while 60%, although they managed to save money from parents' contributions, the funds were insufficient. The obtained funds were solely allocated to maintaining fundamental existing technologies such as computers, projectors, and office internet. One of the principals conveyed that:

> "The school is not able at all to purchase all the required educational technologies. The tuition money from the government is mainly for buying

textbooks, other school infrastructure and maintenance of basic technologies we have around and payment of the office Wi-Fi only" (Informant 3, 2023)

The integration of education technology integration is significantly impacted by various factors, including those related to the government, schools, teachers, and students (Murundu et al., 2017). However, it appears that the primary categories influencing teachers and students are the school and government, as they play a crucial role in providing essential measures such as infrastructure (Tchombe, 2008).

The interviewer probed further to comprehend the government support measures concerning educational technologies in public secondary schools. The response unveiled that no initiatives have been undertaken by the government regarding integration of technology in education in these schools and particularly in the context of CRE, as indicated in the excerpt below.

> "No, we tried to approach the government for help in terms of technology purchases, but nothing happened. However, the money allocated by the government to public secondary schools is inadequate to even cater for educational technologies. The school and the BOM usually attend to the most prioritized needs other than educational technologies." (Informant 7, 2023)

The findings were in harmony with Elias and Mwila's (2022), assertion that public schools lack adequate resources in terms of educational technologies, and proposed measures to address this inadequacy often go unimplemented, resulting in subpar learning outcomes

4.4.4 Inadequate Educational Technologies

During the interviews, the principals were asked how they acquire technologies for learning purposes. The results indicated that 20% obtained from parents, 20% borrow from nearby primary schools, 10% use savings and donations, and 50% utilize tuition money savings and principals' voluntary contributions. However, despite these efforts, the technologies are inadequate for use by all teachers. Consequently, science and mathematics teachers are more likely to utilize the available technologies, given the perceived complexity of these subjects compared to CRE. One of the principals expressed the following:

> "We acquire these technologies from the little savings we have from tuition funds, parents' donations, and personal support. I bought two projectors and

> Android TV for the school, and I use them to teach my biology classes through YouTube. In addition, these technologies are however accessible to the mathematics and other science teachers as the subjects are a bit hard for students, and the technologies aid in making them quite easy." (Informant 4, 2023)

Mwai (2015) argues that the initial measure towards the uptake of educational technologies in CRE involves the provision of these technologies. However, without their availability, the sustained utilization and integration of them into CRE become impractical.

4.4.5 Denial of access to educational technologies

Principals were queried about whether their schools had a computer laboratory and how a CRE teacher could access it when needed. Half of the principals (50%) responded that they do not have a computer lab. The remaining 50% who acknowledged having one, explained that the laboratory was exclusively accessible to computer studies and science teachers and students, leaving CRE instructors and students without access. One of the principals articulated the following:

> "Yes, we have a computer laboratory strictly for computer studies lessons. It is also accessed by science teachers and the school principal for her classes. CRE teachers and students do not get a chance to use the computer laboratory." (Informant 7, 2023).

Current research highlights that the most fundamental measure to encourage the usage of educational technologies in CRE is to ensure that instructors and students have access to available technologies (Johnson et al., 2016). For this reason, as pointed out by Wood et al. (2005) individual factors influencing technology use, such as technophobia, often stem from equipment-related issues, including restrictions on usage even when the technology is available

4.4.6 Limited Motivation measures

During the interviews principals were questioned about the measures, they have implemented to encourage CRE teachers and students to adopt educational technologies. The findings indicated that the majority, 6 (60%) stated that they have not implemented any measures for the CRE subject. One of the principals expressed the following:

> "None at the moment for CRE. The only thing I can do is to motivate them to use the technologies, but for mathematics and science which are more practical in nature, I would say the training have really encouraged them to use educational technologies in teaching." (Informant 9, 2023).

The teacher is essential in the integration process by imparting knowledge and skills to learners. Therefore, they need to undergo training, mentoring, motivation and be supported to effectively incorporate technology in learning (Kutto, 2019). However, school principals perceived science subjects to be more practical for technological usage compared to CRE. Therefore, a significant number of principals prioritize STEM subjects for the utilization of educational technologies, placing more emphasis on them compared to humanities subjects, particularly CRE (Karakostantaki & Stavrianos, 2021). Additionally, the principals were also questioned about the measures they have implemented to support CRE students in utilizing educational technologies. The majority, 6 (60%) stated that there were no specific measures to support them; however, 40% indicated having a few measures to support CRE students, as evident in the excerpt below.

> "We have not set measures to support CRE students in using technologies in their learning. However, we allow students on some weekends to watch the St. Luke's gospel videos organized by their teachers and they have CDs of the same." (Informant 2, 2023).

Karkouti (2021) explains that in situations where teachers and students of CRE are devoid of support, motivation, and encouragement to employ educational technologies, there is a notable probability that the rate of adoption will be considerably lower.

4.5 Factors influencing teachers' perceptions towards educational technologies.

4.5.1 Teachers' Factors

A five-point Likert scale was employed to examine the factors influencing teachers' perceptions of educational technologies. Frequencies and Weighted Average Index (WAI) were used to analyze the data. To establish the factors influencing teachers' perceptions a multiple regression analysis was conducted where the independent variables were subjected to collinearity and multicollinearity trials prior regression analysis

Table 4.4: Factors influencing teachers' perceptions

Statement	1(SD)	2(D)	3(UN)	4(A)	5(SA)	WAI	Rank
I can cope with the rapid technological changes in teaching CRE (technological changes)	0	2	4	16	8	4.00	1
I like using education technologies in my teaching of CRE (like- attitude)	0	2	5	15	8	3.97	2
I am comfortable and confident using technology in teaching CRE (confident & comfortable)	1	3	3	12	11	3.97	2
I have adequate skills to use educational technology in CRE (skills)	2	2	5	13	8	3.77	4
I have support from the school administration to use technology in CRE (support)	1	6	5	13	5	3.50	5
I have enough time to learn about educational technologies in CRE (time)	3	4	6	13	4	3.37	6
There are technological resources in this school to use in CRE (technological resources)	2	14	4	8	2	2.80	7
There are workshops/training in this school to motivate me to use technology in teaching CRE (workshops/trainings)	11	11	5	2	1	2.03	8
Weighted Average						**3.43**	

SD (Strongly Disagree), D (Disagree), UN (Undecided), A(Agree), SA (Strongly Agree) and WAI (Weighted Average Index)

From Table 4.4, WAI was computed to rank the factors that influence teachers' perceptions towards uptake of educational technologies. Nzomo et al. (2023) suggest that an overall mean score of above (3.0) on a Likert scale indicates a high score and reflects positively on the variables being studied. The overall mean was 3.43, which was slightly higher than 3.0, indicating the factors moderately influenced teachers' perceptions. Teacher personal attributes such as adaptability to rapid technological changes in teaching CRE, liking to use educational technologies in CRE instruction, comfort, and confidence in employing technology, and possession of adequate technological skills for CRE instruction achieved high WAI scores of 4.0, 3.97, 3.97, and 3.77, respectively. Conversely, factors associated with school support, including administrative support for technology use in CRE, availability of time for learning about educational technologies, presence of technological resources for CRE, and existence of motivational workshops for technology integration in CRE, scored lower WAIs of 3.50, 3.37, 2.80, and 2.03, respectively. The results suggested that teachers necessitate educational technological resources for teaching CRE. Furthermore, the findings emphasize the importance of schools organizing intensive and ongoing training sessions and workshops to incentivize teachers to utilize technologies in teaching CRE. The results were consistent with Özgün and Saritepeci (2021), who suggest that integrating technology has become essential in classrooms to sustain effective technology-assisted teaching. They advocate for teachers to attain the requisite technological competence through ongoing trainings sessions and workshops tailored to their courses.

4.5.2 Teachers' Perceptions

Table 4.5 below shows teachers' perceptions towards educational technologies

Table 4.5: Teachers' perceptions towards educational technologies

STATEMENT	1(SD)	2(D)	3(UN)	4(A)	5(SA)	WAI	Rank
I would like to use technology in my teaching in CRE.	0	1	0	11	18	4.53	1
Technology helps me in preparation of the learning materials in CRE	0	0	1	12	17	4.53	1
Technology can enhance students' learning in CRE.	0	0	0	15	15	4.50	3
Using technology makes teaching interesting and enjoyable in CRE.	0	1	0	13	16	4.47	4
Technology makes me as a CRE teacher more creative and innovative.	0	1	1	11	17	4.47	4
Technologies improves presentation of my teaching materials in CRE.	0	0	1	15	14	4.43	6
I find technology useful as it makes my work easier in CRE	0	1	2	11	16	4.40	7
Technology makes me productive in my teaching in CRE	0	0	2	14	14	4.40	7
Technology helps me to organize my work as a teacher in CRE.	0	1	1	14	14	4.37	9
Technology saves my time and effort in CRE	0	1	3	10	16	4.37	9
Technology improves my job performance as a teacher in CRE	0	2	1	13	14	4.30	11
I prefer my own method of teaching (conventional) in CRE.	4	6	6	9	5	3.17	12
Weighted Average						**4.33**	

SD(Strongly Disagree), D (Disagree), UN (Undecided), A(Agree), SA (Strongly Agree) and WAI (Weighted Average Index)

Table 4.5 captured teachers' collective perceptions regarding utilization of educational technologies in teaching CRE. According to Mazana et al. (2018), an overall mean exceeding 3.0 on a Likert scale signifies a very high rating, reflecting a highly positive characteristic of the variables being examined. The overall WAI was 4.33 implying teachers perceived educational technologies positively in CRE and agreed with the study's items. The finding contradicted those of Kulal and Nayak (2020), that while students exhibit positive perceptions towards technologies, teachers often hold mixed opinions and reactions about educational technologies.

4.5.3 Correlation of Teachers' Independent variables to determine Linearity

McCaw et al. (2020) elucidate that it is imperative to verify the statistical assumptions of linearity and independence before to conducting regression analysis. The outcomes of verification are displayed in table 4.6 below.

Table 4.6: Correlation of Independent variables for the teachers' factors

	Time	Skills	Technological resources	Support	Technological changes	Like-attitude	Workshops/ Training	Confident & Comfortable
Time	1							
Skills	0.475	1						
Technological resources	-0.278	-0.173	1					
Support	-0.118	-0.041	0.581	1				
Technological changes	0.489	0.476	0.111	0.225	1			
Like-attitude	0.081	0.277	0.101	-0.018	0.342	1		
Workshops/ training	0.017	-0.022	0.322	0.336	-0.078	0.039	1	
Confident & Comfortable	0.3	0.63	-0.173	0.043	0.529	0.59	0.06	1

As illustrated in Table 4.6, the results were consistent with Kinini et al. (2023) who proposes that values above the threshold of 0.75 indicate high correlation in a collinearity test. Consequently, all the factors were deemed appropriate for analysis as they were below 0.75. Therefore, all the eight factors were chosen for further analysis.

4.5.4 Multicollinearity test of teachers' independent variables

Table 4.7: Multicollinearity of teachers' independent variables

Variables	VIF	Tolerance (1/VIF)
Time	1.836	.545
Skills	2.013	.497
Technological resources	2.171	.461
Support	1.813	.551
Technological changes	2.281	.438
Like-attitude	1.816	.551
Workshops/training	1.348	.742
Confident & comfortable	3.132	.319
Mean VIF	**2.051**	

As illustrated in Table 4.7, the VIF values ranged from 1.348 to 3.132, with an average of 2.051. Correspondingly, the tolerance (1/VIF) values varied between 0.319 and 0.742. Given that, VIF was below 5 indicated absence of multicollinearity problem thus variables were suitable for analysis. A VIF below 5 suggests that the there is no correlation while a VIF exceeding 5 to 10 poses challenges and potential issues with multicollinearity (Ahmad et al., 2023; Saptono et al., 2021).

Table 4.8: Model summary in regression Analysis

Sample	R	R^2	Adjusted R^2	Std. Error of Estimate	Durbin-Watson
	.636[a]	.405	.178	.42047	1.931

a Predictors: Teachers' factors.

The coefficient of determination (R^2) indicates the degree in which the independent variable could explain the dependent variable (Saoke et al., 2023). However, in

regression analyses involving multiple independent variables, the adjusted R^2 is favored as the coefficient of determination (Yudiawan et al., 2021). In the study, there were several independent variables, therefore, the adjusted R^2 was used as the determination coefficient. The adjusted R^2 was 0.178 (18%) which indicates the effect of independent variables on the dependent variable (Table 4.8). The results suggested that the factors influenced 18% of the teachers' perceptions towards educational technologies. The remaining 82% is influenced by other factors not in our model. According to Fagerland and Hosmer (2016) and Ginkel and Kroonenberg (2014) ANOVA should be carried out to verify the model's goodness of fit. Table 4.9 presents the ANOVA findings on the model goodness-of-fit.

Table 4.9: Analysis of Variance Results on model goodness-of-fit

Sample	**Sum of Squares**	**Df**	**Mean Square**	**F**	**Sig.**
Regression	2.523	8	.315	1.784	.137[b]
Residual	3.713	21	.177		
Total	6.235	29			

[a] Dependent variable- teachers' perceptions

Table 4.9 indicates that, although the data met all the assumptions of multiple regression analysis, including collinearity and multicollinearity tests (Table 4.6), the model was not statistically significant at the 0.05 significance level. The (p=0.137) was above the threshold (.05). This was attributed to the relatively smaller sample size (n= 30) which impacted the statistical power. Scholars such as Cohen (1962), Erdfelder et al. (2009), Hoenig and Heisey (2001), Stevens (2012), and Wickens and Keppel (2004) have noted that small sample size can impact the statistical power of results in ANOVA models, despite individual predictor variables demonstrating significant relationships in collinearity and multicollinearity tests along with meeting other assumptions of regression analysis.

Table 4.10: Co-efficient results on determination of factors influencing teachers' perceptions

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
	(Constant)	3.080	.530		5.813	.000
	Time	-.122	.089	-.314	-1.374	.184
	Skills	.136	.098	.334	1.399	.177
	Technological resources	.052	.102	.127	.511	.615
	Support	-.117	.095	-.279	-1.232	.231
	Technological changes	.165	.142	.296	1.164	.258
	Like-attitude	.123	.124	.226	.995	.331
	Workshops / training	.165	.085	.380	1.942	.066
	Confident & comfortable	-.019	.126	-.046	-.153	.880

From Table 4.10 above, all the variables influenced teachers' perceptions though the influence was not statistically significant at (.05) significance level. The beta coefficients (Table 4.10), indicate the effect of the factors towards teachers' perceptions. Consequently, it suggests that, having enough time to learn about technology explained 31.4% of the variation in teachers' perceptions. Having adequate skills explained 33.4%, availability of technological resources explained 12.7%, having school and administration support to use technology explained 27.9%, ability to cope with rapid technological changes explained 29.6%, developing a like attitude towards technology explained 22.6%, having workshops and training on educational technology explained 38% and being confident and comfortable explained 4.6% of the variations in teachers' perceptions holding other factors constant. The regression line

for the factors influencing teachers' perceptions was $Y = 3.080\text{-}0.122X_1 + 0.136X_2 + 0.052X_3\text{-}0.117X_4 + 0.165X_5 + 0.123X_6 + 0.165X_7\text{-}0.019X_8$

Additionally, on the significance results, availability of time to learn about technology (β = -0.122, p= 0.184), support from the school (β = -0.117, p = 0.231), and teachers' confidence and comfortability in using educational technology to teach CRE (β= -0.019, p=0.880), negatively influenced perceptions. This implied that, as teachers felt they have adequate time for technology learning, they have support from school, and they are confident and comfortable with educational technologies their perceptions decreased. The findings diverged from the conclusions drawn by Ertmer and Ottenbreit-Leftwich (2010), who identified time availability, school support and teachers' confidence and comfort as the primary predictors of their adoption of technology.

Teachers' endorsement of possessing adequate technological skills, availability of technological resources, ability to cope with technological changes, liking to teach with technologies, and the availability of training sessions and workshops in schools positively influenced their perceptions. The regression coefficients for these factors were (β= 0.136, p= 0.177), (β= 0.052, p= 0.615), and (β= 0.165, p= 0.258), (β= 0.123, p= 0.331), (β= 0.165, p= 0.066), respectively. This implies that teachers are anticipated to increase their perceptions towards technology if they have access to sufficient technological resources, demonstrate proficiency in technology, can adapt to rapid technological changes, display a like attitude towards educational technologies, and have opportunities for relevant training and workshops. The findings corroborated with the conclusions drawn by Manduku et al. (2012), Mumtaz (2000) and Naveed et al. (2020), indicating that effective technology integration occurs when teachers' perceptions are addressed through training to enhance their skills, provision of technological resources and ability to cope with swift technological advancements. Additionally, Andoh, (2012) observed that when teachers lack adequate training on the integration of technologies more so in CRE, they tend to take a back seat for traditional methods of teaching to dominate.

4.6 Factors Influencing Students' Perceptions towards Educational Technologies.

4.6.1 Students' Factors

Table 4.11 below shows the factors that influence students' perceptions towards educational technologies

Table 4.11: Factors influencing students' perceptions

Variables	1(SD)	2 (D)	3 (UN)	4 (A)	5 (SA)	WAI	Rank
I just like using educational technology in learning CRE (Like-attitude).	10	17	19	115	139	4.19	1
I have adequate skills to use educational technologies in CRE (Skills).	21	39	31	123	86	3.71	2
I can cope with the rapid technological changes in learning CRE (Technological changes).	37	25	38	113	87	3.63	3
I have enough time to learn about educational technologies in CRE (Time)	30	50	28	107	85	3.56	4
I have support from school administration and my teachers to use technology in CRE (support).	67	76	23	78	56	2.93	5
There are technological resources for learning CRE in my school (Technological resources).	80	84	26	81	29	2.65	6
There are workshops /training in my school to motivate me to use technology in CRE (Workshops & trainings) .	138	86	27	29	20	2.02	7
Weighted Average						**3.24**	

SD (Strongly Disagree), D (Disagree), UN (Undecided), A(Agree) and SA (Strongly Agree), WAI(Weighted Average Index)

According to Table 4.11, the research computed the WAI to rank the factors that influence students' perceptions regarding educational technologies in CRE. The overall WAI was 3.24, which was considered favorable indicating that the identified predictors moderately influenced students' perceptions regarding educational technologies in CRE. According to Ramnarain and Ramaila (2018), a mean total score above (3.0) on a Likert scale is classified as very high, indicating a highly positive attribute of the variable under study, while a mean of below (3.0) suggests otherwise.

Personal attributes of the students such as liking to use educational technologies in CRE, possessing adequate skills in using educational technology in CRE and ability to cope with rapid technological changes in learning CRE obtained highest WAI scores of 4.19, 3.71, 3.63, respectively. Conversely, factors related to school, such as having enough time to learn about educational technologies in CRE, receiving support from school administration to use technology in CRE, having access to technological resources in school for learning CRE, and the provision of training on technology to motivate students, scored lowest WAI scores of 3.56, 2.93, 2.65 and 2.02, respectively. This implied that CRE students necessitate support from both the teachers and the school to use educational technologies, emphasizing the importance of having adequate technological resources in schools. Additionally, the findings underscored the need for comprehensive training and workshops to motivate learners to effectively utilize technology in their learning.

4.6.2 Students' perceptions

The table below shows students' perceptions towards educational technologies in CRE

Table 4.12: Students' Perceptions

Statement	1(SD)	2(D)	3(UN)	4(A)	5(SA)	WAI	Rank
I would like to learn more and use educational technologies in CRE.	1	6	18	86	189	4.52	1
Using technology makes my learning interesting and enjoyable in CRE.	5	2	16	97	180	4.48	2
Technology enables me to understand concepts better in CRE by accessing more learning materials.	6	7	17	107	163	4.38	3
Technology helps me to be creative and innovative in CRE.	2	7	22	133	136	4.31	4
Educational technologies enhance my own learning in CRE thus motivating me	4	5	23	144	124	4.26	5
I find technology useful as it makes my work easier in CRE.	12	11	26	119	132	4.16	6
Technology can improve the way my CRE teacher presents learning materials.	8	16	23	130	123	4.15	7
Using educational technologies to learn CRE saves my time and effort.	11	21	24	103	141	4.14	8
Educational technologies make me more productive in learning CRE.	8	11	33	136	112	4.11	9
I find technology useful for leisure activities e.g., interacting through CRE WhatsApp group	40	20	23	85	132	3.83	10
I prefer my CRE teacher's method of teaching (conventional method)	41	80	40	62	77	3.18	11
Weighted Average						**4.14**	

SD (Strongly Disagree), D (Disagree), UN (Undecided), A(Agree), SA (Strongly Agree), WAI (Weighted Average Index)

The study items in Table 4.12 reflects students' overall perceptions towards educational technologies in CRE. The overall WAI was 4.14, which revealed that most students had positive perceptions towards educational technologies and agreed with the items under study. In addition, Mazana et al. (2018) explain that an overall mean score above (3.0) on a Likert scale is classified as very high signifying a highly positive attribute of the study's variables. The findings corroborated with those of Khan et al. (2021) and Malekani (2018) in India and Tanzania respectively who revealed that students have positive perceptions towards educational technologies. Research by Lumpkin et al. (2015) and Sari and Wahyudin (2019) emphasized the need for students to maintain positive perceptions of educational technologies. This requires establishing a learner-centered environment that is both captivating and enjoyable for technology-assisted learning. Additionally, the teaching of technological skills should be enhanced by incorporating suitable digital literacy into the curricula. It is also essential to guarantee accessibility to educational technologies that are user-friendly and customized to accommodate the diverse needs and preferences of students.

4.6.3 Correlation of students' independent variable to determine linearity

Sanderson and Windmeijer (2016) explain that the statistical assumption of linearity and independence should be checked before carrying out regression analysis. The outcomes are displayed in Table 4.13.

Table 4.13: Correlation of students' independent variables

	Time	Skills	Technological resources	Support	Technological changes	Like-attitude	Workshops/training
Time	1						
Skills	0.282	1					
Technological resources	0.016	0.088	1				
Support	0.002	0.078	0.31	1			
Technological changes	0.206	0.324	0.181	0.084	1		
Like-attitude	0.229	0.276	0.117	0.038	0.377	1	
Workshops/training	-0.026	0.229	0.415	0.232	0.171	0.1	1

The findings in Table (4.13), concurred with Kinini et al. (2023) that in a collinearity test, variables with a value of below 0.75 indicate a low correlation. Therefore, this implied that all the independent factors were considered suitable for the analysis as there was no evidence of collinearity.

Table 4.14: Multicollinearity test results showing correlation between students' independent variables

Variables	VIF	Tolerance (1/VIF)
Time	1.139	0.878
Skills	1.262	0.792
Technological resources	1.307	0.765
Support	1.124	0.890
Technological changes	1.279	0.782
Like-attitude	1.229	0.814
Trainings/workshops	1.298	0.770
Mean VIF	**1.234**	

As depicted in Table 4.14, the VIF values varied between 1.124 and 1.307, with a mean of 1.234. Correspondingly, the tolerance (1/VIF) varied between 0.765 and 0.890. Given that, VIF was less than 5, signified the absence of multicollinearity problem among the independent variables thus eligible for analysis. Notably, researchers argue that a VIF below 5 suggests no correlation between the independent variables, while a VIF of more than 5 to 10 indicate highly correlated variables and potential issues with multicollinearity in their estimations (Shan et al., 2023; Shrestha, 2020).

Table 4.15: Model summary in regression Analysis

Sample	R	R^2	Adjusted R^2	Std. Error of Estimate
	.486[a]	.236	.218	.43652

From the findings (Table 4.15), a moderately positive correlation (r=0.486) was found between the variables. According to Agnetta et al. (2022) a correlation of 0.31 to 0.5, indicates a moderate correlation. The coefficient of determination R^2, indicates the degree to which the independent variable can account for the variation in the dependent variable (Saoke et al., 2023). However, the adjusted R^2 is utilized as the determination coefficient in regression analyses with several independent variables (Yudiawan et al., 2021). In the study, there were several independent variables, therefore, the adjusted R^2 was used as the coefficient of determination. Simba et al. (2016) stated that the coefficient of determination should be between 0 and 1 to be considered significant, whereas in this study the adjusted R^2 = 0.218 (22%) (Table 4.15). Therefore, the findings highlighted that the explanatory variables accounted for 22% of the variability in students' perceptions regarding educational technologies in CRE. In other words, the independent variables accounted for 22% of the dependent variable. This meant that, the remaining 78% of the variability was influenced by factors other than those considered in the current study model. Oyediran et al. (2020) affirms that ANOVA tests are suitable for testing the model's goodness-of-fit. To check the goodness-of-fit of the regression model, ANOVA test was obtained (Table 4.16).

Table 4.16: ANOVA results on model goodness-of-fit

Sample	**Sum of Squares**	**Df**	**Mean Square**	**F**	**Sig.**
Regression	17.192	7	2.456	12.889	.000[b]
Residual	55.641	292	.191		
Total	72.833	299			

[a] Dependent Variable: Students' Perceptions

The outcomes from Table 4.16 above showed that the model was statistically significant (p= .000). This meant that the regression model was suitable for examining the factors that influence students' perception towards educational technologies. A multiple regression analysis (Table 4.17) was conducted to investigate how the factors influenced students' perceptions towards educational technologies.

Table 4.17: Co-efficient results on factors that influence students' perceptions

Model		Unstandardized Co-efficient		Standard Coefficient	t	Sig.
		B	**Std Error**	**Beta**		
	Constant	3.090	0.134		23.08	0.000
	Time	0.094	0.020	0.253	4.63	0.000
	Skills	-0.007	0.023	-0.016	-0.28	0.778
	Technological resources	0.058	0.021	0.163	2.78	0.006
	Support	-0.030	0.018	-0.090	-1.66	0.097
	Technological changes	0.013	0.022	0.034	0.58	0.560
	Like-attitude	0.147	0.028	0.301	5.31	0.000
	Workshops & training	0.005	0.023	0.013	0.23	0.819

The standard beta coefficients indicate the effect of the factors towards students' perceptions. Holding other factors constant, having enough time to learn about technology explained 25.3% of the variation in students' perceptions. Having adequate skills explained 1.6%, availability of technological resources explained 16.3%, having school and teacher support to use technology explained 9%, ability to cope with rapid technological changes explained 3.4%, developing a like attitude towards technology explained 30.1%, having workshops and training on educational technology explained 2.3% of the variations in teachers' perceptions holding other factors constant. The regression line for factors influencing students' perceptions was $Y = 3.090 + 0.094X_1$-$0.007X_2 + 0.058X_3$-$0.03X_4 + 0.013X_5 + 0.147X_6 + 0.005X_7$

On the significance level, the results indicated that time (β=0.094, p=.000), availability of educational technologies in learning (β=0.058, p=.006) and developing a like attitude to learning with technologies in CRE (β=0.147, p=.000), positively and significantly influenced perceptions at (0.05) significance level. This suggests that an increase in the time allocated for learning with technologies will result in an

enhancement of students' perceptions towards educational technologies (β= 0.094, p= .000). This finding contradicts the notion by Harrell and Bynum (2018) that individuals tend to perceive technology negatively because of time required for its integration into the curriculum and learning processes, which demands additional training and planning. Inan and Lowther (2010) further explains that the process of integrating technology necessitates preparation, classroom management strategies, and attention that is typically not allocated to these areas. Consequently, maintaining the status quo may be perceived as a simpler option. The findings corroborated with Francom (2020), Lawrence and Tar (2018) and Tondeur et al. (2017) assertion that time has a positive influence on perceptions of education technology. They highlight that lack of time acts as a deterrent to increased technology usage, as it constrains opportunities for the development of technological skills.

The positive and significant influence of the availability of educational technologies on students' perceptions was confirmed in this study (β= 0.058, p= 0.006). This aligns with Mumtaz's (2000) perspective, emphasizing that the effectual use of technology for learning purposes is contingent upon the accessibility of educational technologies. Consequently, the absence of essential educational resources is cited as a reason why students may not utilize technology in the classroom. Conversely, the results contradict Inan and Lowther's (2010) findings, which argued that increased availability of educational technologies in schools does not necessarily translate to improved teaching. Empirical support is insufficient to assert that access to educational technologies has unequivocally resulted in improved test scores or elevated instructional quality to enhance students' learning (Lim & Chai, 2008; Lowther et al., 2008).

Developing a like-attitude towards educational technologies positively and significantly influenced students' perceptions (β=0.147, p=.000). These findings align with analyses conducted by Ismaili (2020) and Naveed et al. (2020), revealing a significant association between students' attitudes and their adoption of educational technologies. According to Luu (2022), the successfulness of educational technologies for instructional purposes hinges on students developing a positive attitude towards them. Conversely, a negative attitude among students has an unfavorable effect on the utilization of education technologies (Kisanga, 2016).

In contrast, factors such as students' skills, adaptability to technological changes, support from school and teachers, and trainings or workshops on educational technologies were statistically insignificant at (.05) significance level. The students' skills to learn with educational technologies (β= -0.007, p=0.778) were found not to influence their perceptions towards educational technologies. The findings contradict Manning et al. (2017), who demonstrated that possessing essential technological skills contributes to increased knowledge and positive perceptions of educational technologies. The deficiency in motivation, self-efficacy, technological skills, and knowledge of specific technologies emerged as barriers preventing students from utilizing technologies in their learning (Niemi & Kousa, 2020). Additionally, Jasik et al. (2016) and Mailizar et al. (2020) highlighted poor technological skills among students as a significant issue raised by both History and Mathematics teachers, limiting effective technology use in learning, especially during remote learning periods.

The support from the teachers and school administration for the utilization of educational technologies demonstrated a negligible negative impact on students' perceptions (β= -0.030, p=0.097). This outcome contradicts the findings of Hew and Brush (2007) and Kilinc et al. (2016), who highlighted that school and teachers' support regarding students' educational technology usage is a critical external factor that significantly influences adoption decisions. As noted by Ertmer (2005) the support offered by teachers and the school environment can function either as a hindrance or an enhancer towards technology. The adaptability of students to technological changes showed an insignificant impact on their perceptions of educational technologies (β= 0.013, p=0.560). This corroborate with the findings of Johnson et al. (2016), indicating that the inability to cope with rapid technological innovations has been frequently cited as the primary reason for not actively incorporating new technologies. The research further suggests that, due to this factor, both students and their teachers often choose and find satisfaction in traditional classroom methods.

The training and workshops aimed at motivating students to use technologies demonstrated a negative influence on their perceptions towards educational technologies (β=0.005, p=0.819). This finding corroborated the conclusions of Harrell and Bynum (2018) and Wilkerson et al. (2016) suggesting that offering workshops and training opportunities in technology use does not necessarily result to greater level of

integration in the classroom. Conversely, Lee (2002) emphasizes the importance of training and workshops as crucial components in the educational technology integration. However, most of the training and workshops offered focus on fundamental computer operations rather than modernized computer expertise and specified pedagogy for different subjects. A significant limitation is highlighted by Lawrence and Tar (2018), who argue that inadequate training serve as a barrier, hindering individuals from effectively utilizing technologies. It is asserted that for training and workshops to contribute to the integration of educational technologies, they must be tailored to specific skills, supported by adequate educational technological resources, and backed by sufficient support from school administration and teachers at large (Papanastasiou et al., 2003).

The negative prediction of students' skills, support from school and teachers, their ability to cope with rapid technological changes and availability of training and workshops could be ascribed to varied reasons. such as technology experience, their different learning styles, their attitude towards the subject, their performance, teachers' motivation among other individual predictors. This concurred with Perera and Abeysekera (2022), Popovici and Mironov (2015), Salem et al. (2019) and Seddon and Biasutti (2009) who argue that students being in a technology saturated environment and having requisite technological skills is not a guarantee for them to use educational technologies. Certain predictors such as technology experience, individual learning styles, perception of the subject, performance and effort expectancy and social influence predictors contribute to shaping their perceptions of the usage of educational technologies.

4.7 Relationship between teachers' perceptions and uptake of educational technologies

A five-point Likert scale was used to indicate teachers' and students' perceptions of educational technology usage in CRE. A Pearson correlation analysis was employed to examine the nature of the association between the two variables, perceptions, and uptake of educational technologies for teachers and students, respectively.

4.7.1 Teachers' Perception and Uptake of Educational Technologies

From Table 4.5 on teachers' perceptions, the overall mean was (mean= 4.33) which is above the Likert scale mean of 3.0. The outcomes revealed that teachers have positive

perceptions towards educational technologies. The uptake of teachers towards educational technologies on a five-point Likert scale was used as depicted in the Table 4.18 below.

Table 4.18: Teachers' uptake of educational technologies

Educational technologies	N (%)	R (%)	S (%)	O (%)	A(%)	Mean
Computers	26.7	16.7	40	10	6.7	2.53
Internet	10	13.3	16.7	26.7	33.3	3.60
Smartphones	6.7	13.3	23.3	23.3	33.3	3.63
Laptops	23.3	3.3	26.7	23.3	23.3	3.20
Google	6.7	13.3	26.7	20	33.3	3.60
Virtual Learning Environment	63.3	3	6.7	0	0	1.43
Social learning platforms	23.3	30	26.7	10	10	2.53
Overall Mean						**2.93**

N-(Never), R- (Rarely), S- (Sometimes), O- (Often), A- (Always)

From the teacher's uptake of technologies results, a 5-point Likert scale (5= Always (A), 4= Often (O), 3=Sometimes (S), 2= Rarely (R) and 1=Never (N) were used to measure the uptake of educational technologies in CRE among teachers and students. Mean values of the scores on the Likert scale for uptake were computed and interpreted as indicative of level of uptake. A mean of (1.0-1.4) indicated never, (1.5-2.4) suggested rarely used, a mean of 2.5-3.4 indicated sometimes used, a mean of (3.5-4.4) indicated often used while a mean of (4.5-5.0) indicated always used. From the table the mean ranges from 3.63 and 1.43. The results indicated virtual learning environments like e.g., zoom and google meet showed that they were never used (mean= 1.43). Social learning platform e.g., WhatsApp and Facebook, computers and laptops were sometimes used, and their means were (2.53, 2.53 & 3.2) respectively. Internet, smartphones, and google were often used in teaching CRE. Their means were (3.60, 3.63 & 3.60) respectively. The overall mean for teacher uptake was (2.93) showing the education technologies were used sometimes by the teachers in teaching CRE. The findings were consistent with Kearney et al. (2018) and Kiptalam and Rodrigues (2013) that the commonly used technologies in teaching and learning are

smartphones, internet, google, projectors, computers, laptops, and the social learning environments.

4.7.2 Correlation analysis

To find out the association between teachers' perceptions and the uptake of educational technologies a correlation analysis was carried out.

Table 4.19: Correlation analysis between Teachers' Perceptions vs Uptake

		Teachers' uptake levels
Teachers' perceptions	Pearson Correlation	.142
	Sig. (2- tailed)	.453
	N	300

The teachers' perceptions and their technology uptake levels in CRE were matched. The outcome suggests that there is a weak link between perceptions and uptake of educational technologies (r= .142, p= .453). However, the p-value (.453) being greater than (.05) imply there is no relationship at 0.05 significance level. The findings align with those of Bariham (2022), indicating that teachers' perceptions do not significantly influence their adoption of educational technologies. Furthermore, as highlighted by Kulal and Nayak (2020), teachers express dissatisfaction with the training provided by schools, leading to challenges in incorporating technologies into their teaching practices. This sentiment was reflected in the responses to their questionnaire regarding the frequency of training sessions organized by the school for integrating educational technologies: 73% of teachers reported never receiving such training, 17% reported receiving it once a year, and 10% reported receiving it once a term.

4.8 Relationship between students' perceptions and uptake of educational technologies

From (Table 4.12) on students' perceptions the overall mean was (Mean= 4.11). Therefore, the results revealed students have positive perceptions towards educational technologies.

4.8.1 Students' perceptions and uptake of educational technologies

The uptake of students towards educational technologies on a five-point like scale was also established as displayed in Table 4.20 below.

Table 4.20: Students' Uptake of educational technologies.

Educational Technologies	N (%)	R (%)	S (%)	O (%)	A (%)	Mean
Computers	51.3	17.7	17	8.3	17	1.99
Internet	24	13	27	18.3	17.7	2.93
Smartphones	12.3	9	28.7	19.3	30.7	3.47
Laptops	46	13.7	23.3	8.3	8.7	2.20
Google	30.7	12.3	22.3	14	20.7	2.82
Virtual Learning Environment	72.3	10.7	9	3.3	4.7	1.57
Social learning platforms	34.7	19	21.3	8	17	2.54
Overall Mean						**2.50**

N-(Never), R- (Rarely), S- (Sometimes), O- (Often), A- (Always)

A 5-point Likert scale was used to measure the uptake of educational technologies in learning of CRE among the students. Mean values of the scores on the Likert scale for uptake were computed and interpreted as indicative of level of uptake. A mean of (1.0-1.4) indicated never, (1.5-2.4) suggested rarely used, a mean of (2.5-3.4) indicated sometimes used, a mean of (3.5- 4.4) indicated often used while a mean of (4.5-5.0) indicated always used. From the table the mean ranges from 3.47 and 1.57. The results indicated virtual learning environments like e.g., zoom and Google Meet, computers, and laptops were rarely used. They had means of (1.57, 1.99 & 2.20) respectively. Social learning platforms e.g., WhatsApp and Facebook, google and internet were sometimes used, and their means were (2.54, 2.82 & 2.93) respectively. The most often used educational technology in learning CRE by students was a smartphone which had a mean of (3.47). The overall mean for students' uptake was (2.50) showing that education technologies were used sometimes by the students in learning CRE. Additionally, the uptake Likert scale showed that a mean of between (2.5-3.4) suggested that the technologies were sometimes used in the learning of CRE by the students which is in agreement with the study by Bariham et al. (2020), which

highlighted the infrequent use of computers. Their research showed that 89.5% of the participants never used computer tutorials, 63.1% never engaged with simulations, and 75.8% did not use applications. In contrast, the current study indicated that social learning platforms were sometimes used, and mobile phones were often utilized. This is in contrast with the findings of Bariham et al. (2020) who suggested that these tools were not used at all.

4.8.2 Correlational analysis

To find out the association between students' perceptions and the uptake of educational technologies Pearson correlation coefficient was calculated, followed by simple linear regression analysis. This is because the Pearson correlation moment is used to gauge the strength of the linear relationship between two variables in the study (Ahlgren et al., 2003).

Table 4.21: Correlation analysis between Students' Perceptions and Uptake

		Students' uptake levels
Students' perceptions	Pearson Correlation	.180**
	Sig. (2- tailed)	.002
	N	300

** Correlation is significant at the 0.01 level (2-tailed)

According to Table 4.21 above, the findings suggested that there was a weak positive correlation (r= .180, p= .002) between students' perceptions and the uptake of educational technologies in CRE. The p-value (.002) is less than the conventional threshold (.05) meaning the correlation is statistically significance at 99% confidence level. The outcomes show that students' perceptions play a notable role in influencing the uptake of educational technologies in CRE. The findings were in agreement with those of Hussein (2017) who found that students' perceptions and attitudes significantly impact their willingness and intention to utilize educational technologies. Conversely, the results differed from those of Yildiz Durak (2023) who found no correlation between the use of chatbot and factors such as students' autonomy, engagement, and self-efficacy in visual design. The findings suggest that frequency of usage and user satisfaction significantly impact learners' self-efficacy.

4.8.3 Regression analysis

According to Fagerland and Hosmer (2016), Sanderson and Windmeijer (2016), and Ginkel and Kroonenberg (2014), it is essential to verify statistical presumptions of linearity, independence, and normality before conducting regression analysis. Figures 4.1 and 4.2 display the graphs of students' perceptions and uptake of educational technologies to assess their normality**,** Figure 4.3 shows the linearity assumption, and Figure 4.4 shows the homoscedasticity principle.

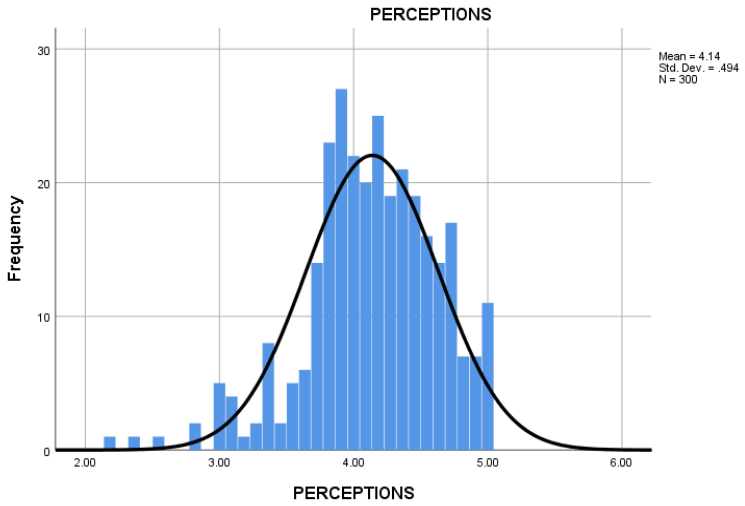

Figure 4.1: Histogram of students' perceptions towards educational technologies

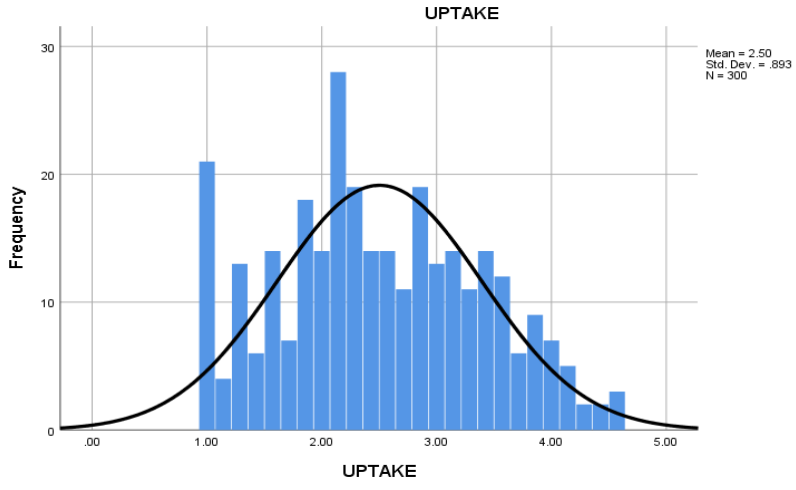

Figure 4.2: Histogram of students' uptake levels of educational technologies.

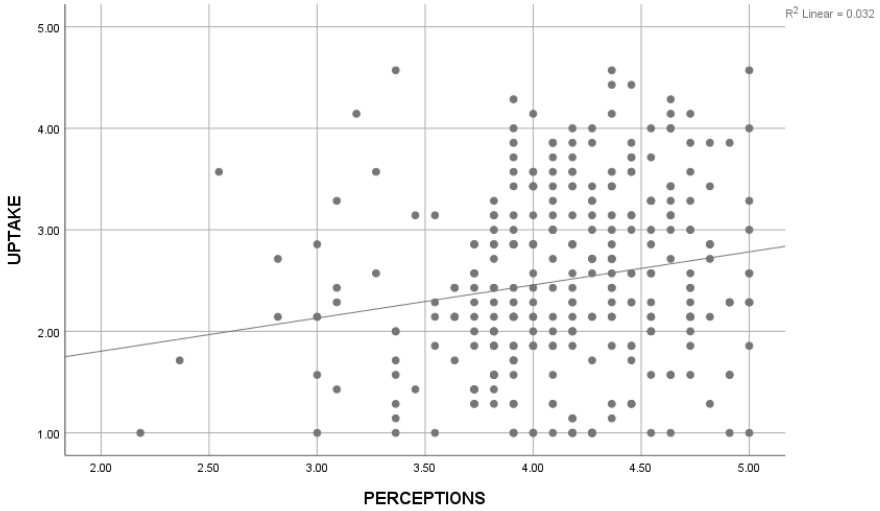

Figure 4.3: A plot of uptake versus students' perceptions

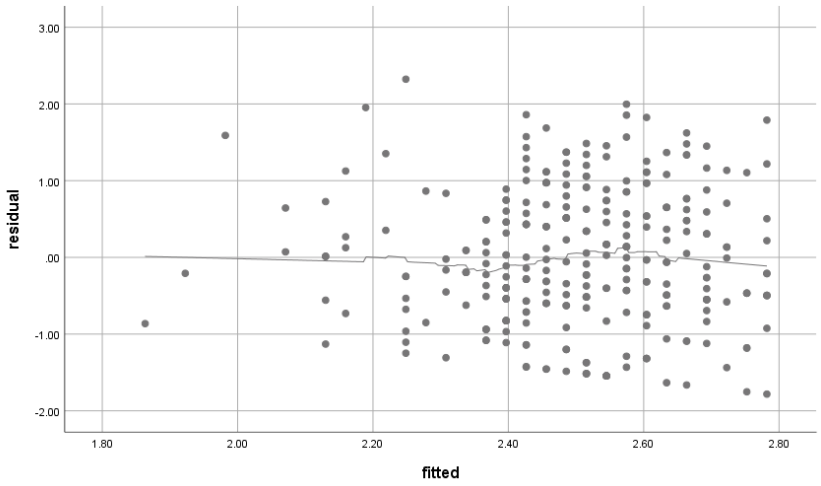

Figure 4.4: Residuals vs fitted values; uptake vs students' perceptions

Figures 4.1 and 4.2 show histograms representing students' perceptions regarding educational technologies and their levels of uptake. The outcomes depicted that the data was normally distributed. Figure 4.3 depicts the linearity of uptake versus students' perceptions. Based on Figure 4.4, the homoscedasticity principle was not violated because the residuals in the scatter plot converged around zero. Homoscedasticity examines the pattern of residuals (discrepancies between the observed and predicted values) at different levels of the independent variable. This assumption is verified by visually inspecting a plot of standardized residuals against the predicted regression value (Hayes & Montoya, 2017). Ideally, the residuals should

be randomly scattered around the zero value to ensure an even distribution (Osborne & Waters, 2003). From Table 4.22 below, the Durbin-Watson test gave a value of 1.576, suggesting there was no autocorrelation and thus confirming that the independence assumption was met. Test statisticians typically consider values between 1.5 and 2.5 as usual, while values outside this range might raise concerns (Glen, 2016). The regression analysis also checked on the fitness of the model as shown in Table 4.22 below.

Table 4.22: Model fitness of students' Perceptions Vs Uptake

Model	R	R^2	Adjusted R^2	Standard Error of the Estimate	Durbin-Watson
1	.180[a]	.032	.029	.88005	1.576

[a] Predictors: (Constant) Perceptions.

Based on Table 4.22, all values of R^2 (0.032) and adjusted R^2 (0.029) were considered significant due to their positive nature. Simba et al. (2016) clarified that the coefficient of determination must be positive and fall within the range of 0 to 1 to be deemed significant. Therefore, from the table above, $R^2 = 0.032$ (3.2%), which indicates that perceptions accounted for 3.2% of the variations in students' uptake of educational technologies in CRE. The Analysis of Variance (ANOVA) is employed to verify the significant explanatory power of the independent variable on the dependent variable (Mungeria, 2021& Nzomo et al., 2023). The ANOVA outcomes are depicted in Table 4.23 below.

Table 4.23: ANOVA: students' perceptions Vs uptake

Model	Sum of squares	df	Mean square	F	Sig.
Regression	7.750	1	7.750	10.006	.002
Residual	230.799	298	.774		
Total	238.549	299			

Table 4.23 stipulated that the model was statistically significant, (F= 10.006, P= .002). This suggested that perceptions were good a predictor of students' uptake towards educational technologies. This implied that perceptions influenced the uptake of educational technologies in learning of CRE. The regression coefficients were calculated, and the results are displayed in Table 4.24 below.

Table 4.24: Distribution of Coefficients

	Unstandardized Coefficients		**Standardized Coefficients**		
Model	**B**	**Std Error**	**Beta**	**t**	**Sig.**
1 Constant	1.152	.430		2.681	.008
Perceptions	.326	.103	.180	3.163	.002

Table 4.24 above shows β= 0.180 and p= 0.002. These outcomes showed a weakly positive correlation between students' perceptions and their uptake of educational technologies in the context of CRE. The results indicated a one-unit increase in perceptions towards educational technologies is associated with a 0.326-unit increase in the uptake of educational technologies. These results corroborate Gray et al. (2020) and Joo. et al. (2014) who discovered a substantial link between perceptions and uptake of educational technologies. However the results differ from those of Agasisti et al. (2020) and Kunina-Habenicht and Goldhammer (2020), who found a negative correlation between students' perceptions and the usage of educational technology.

4.9 Relationship between Teachers' Uptake and Students' Perceived Usefulness

To find out the relationship between teachers' uptake of educational technologies and students' perceived usefulness a correlation analysis was conducted as depicted in Table 4.25.

Table 4.25: Correlation between teachers' uptake and students' perceived usefulness

		Students' perceived usefulness
Teachers' uptake	Pearson Correlation	.104
	Sig. (2- tailed)	.583
	N	30

From Table 4.25, there was no significant relationship between teachers' uptake and students' perceived usefulness ($p > .05$). The results concurred with Kulal and Nayak (2020) that teachers' adoption of technologies does not influence students' perceived usefulness. According to the study students have positive perceptions about educational technologies, however, teachers have mixed opinions about technology in learning.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter summarizes the findings and conclusions based on the outcomes. It also offers recommendations and suggestions for further studies.

5.2 Summary of the Findings

This section summarizes the study's findings based on the research objectives which included establishing measures that schools implement to support uptake of educational technologies in CRE, to determine factors influencing teachers' and students' perceptions towards educational technologies and to analyze the relationship between perceptions and uptake of educational technologies.

5.2.1 Measures schools implement to support CRE teachers and students in uptake of education technology

The study sought to establish measures schools implement to support uptake of educational technologies in CRE. The study found the school had several measures like training of school principals as gate keepers for the integration process, discriminatory teacher professional development, unclear school policy on incentives, inadequate educational technologies, denial of access to educational technologies and limited motivation measures. On the training of principals as gate keeper for integration, all the principals were trained on technology integration. Regarding discriminatory Teacher Professional Development (TPD), principals reported the presence of both internal and external workshops on educational technologies. While these workshops were meant for all teachers, they were discriminatory in nature. The participation of the science and mathematics subject teachers in the workshops was notably higher compared to CRE teachers due to their perceived complexity. On the incentives provided by schools and the government, the study revealed that schools offer support for maintaining current educational technologies. However, government support, primarily funded through tuition fees, predominantly focuses on students' textbooks and infrastructure, with limited support towards the integration of educational technologies, particularly in subjects like CRE. On the provision of educational technologies, the study revealed that schools acquired technologies

through various means such as parental contributions, borrowing, savings, donations, and government tuition funds as well as contributions from principals. Despite these efforts, the technologies remained inadequate for universal use among teachers. Consequently, subjects perceived as challenging by students, such as sciences and mathematics, were given priority for the allocation of educational technologies. On the measure of denial of access to educational technologies, the study unveiled that half of the schools lacked computer laboratories. Among those with such facilities, access was granted to computer studies and science teachers and students, while CRE teachers and students were denied access. For motivation measures to enhance uptake of educational technologies were limited, with 60% of the schools' lacking measures for CRE subject. However, in 40% of schools, CRE students were encouraged to embrace technology through activities like watching St. Luke's gospel videos organized by their teachers on weekends.

5.2.2 Factors influencing teachers' and students' perceptions towards educational technologies

The Weighted average index (WAI) was computed to rank both teachers' and students' factors and perceptions. Teachers had 8 factor items while students had 7 factor items. Additionally, teachers had 12 items on perceptions while students had 11 items. The teachers' factors were subjected to collinearity and multicollinearity tests prior regression analysis. The teachers' factors influenced perceptions however, the influence was not statistically significant at (.05) significance level attributed to the smaller sample size. For the students' factors, time, availability of technological resources, and developing a like attitude to learning with technologies positively and significantly influenced perceptions. In contrast, skills, adaptability to technological changes, support from school and teachers and training and workshops on educational technologies were found not to be statistically significant at (.05) significance level.

5.2.3: Relationship between perceptions and uptake of educational technologies

A Pearson correlation analysis was employed to examine the nature of the relationship that exists between teachers' and students' perceptions and their uptake of educational technologies. The teachers' results revealed that there was no significant relationship between their perceptions and uptake of educational technologies in CRE ($r=.142$, $p=.453$). The student's results indicated a weak positive relationship between their

perceptions and the uptake of educational technologies in CRE (r=.180, p=.002). Additionally, to determine if teachers' uptake of educational technologies influenced students' perceived usefulness of those technologies in CRE, a correlation analysis was conducted. The outcomes indicated that there was no notable association between teachers' uptake and students' perceived usefulness (r=.104, p=.583).

5.3 Conclusions

The study examined the relationship between teachers' and students' perceptions and the uptake of educational technologies in CRE. The study concludes that the association between teachers' perceptions and uptake of educational technologies was not significant due to lack of training. Therefore, teachers require training on educational technologies for successful integration in CRE. According to the students' results, this study suggests that improving perceptions of educational technologies has the potential to enhance the use of educational technologies. The results highlight several strategies and policies that can be implemented in Kenya and similar countries to improve students' perceptions. These strategies include ensuring accessibility and user-friendliness of educational technologies, designed inclusively to cater to the diverse needs and preferences of students. Additionally, enhancing the teaching of technology skills by incorporating appropriate digital literacy into the curricula

5.4 Recommendations

Based on the findings, the study makes the following recommendations:

1. The Ministry of Education (MoE) should implement measures to support the integration of educational technologies, particularly in CRE and other humanities subjects at large. Findings from the study revealed that despite efforts to incorporate technology into the instructional process, the majority of these initiatives predominantly promoted adoption within science and mathematics disciplines, rather than within humanities subjects.
2. It is imperative for policymakers, including entities like the MoE and the Kenya Institute of Curriculum Development (KICD), to develop comprehensive educational technology policies when designing the national curriculum. These policies need to be explicit, clear, and customized to accommodate the perceptions, ideas, opinions, experiences, and diverse needs of CRE teachers and students. This approach aims to establish an inclusive and supportive environment for integrating technology into the instructional process,

acknowledging, and leveraging the unique needs of individual teachers and students.

3. The MoE should advocate for the integration of educational technologies into public secondary schools. This initiative is essential to facilitate the shift from conventional teacher-centered learning pedagogies to 21st-century, technology-based, student-centered learning approaches. Such a transition aligns with the objectives of the Vision 2030 agenda and supports the ongoing adoption of a Competency-Based Curriculum (CBC). The CBC emphasizes the development of key competencies, particularly digital literacy, among students.
4. The MoE should improve teachers' awareness of the newly emerged technology-based teaching strategies that advocate for student-centered pedagogies such as the use of educational technologies through in-service and pre-service training.

5.5 Suggestions for further studies

1. A similar study should be conducted on the relationship between teachers' and students' perceptions and the uptake of educational technologies in subjects other than CRE in both public and private schools in Kenya.
2. The study recommends a similar study on the factors influencing teachers' perceptions, where one can increase the sample size and conduct a similar study. The results were attributed to the smaller sample.
3. Since the study focused on public secondary schools, the study recommends further studies on the teachers' and students' perceptions and the uptake of educational technologies in CRE in private secondary schools in Kenya.
4. The study suggests further research on the gendered differences in factors influencing teachers' and students' perceptions in teaching and learning of CRE in secondary schools.
5. The study suggests similar study on teachers' and students' perceptions and uptake of educational technologies employing Unified Theory of Acceptance and Use of Technology (UTAUT), an extension of TAM.

REFERENCES

Adams, S. O., & Paul, C. (2023). E-government development indices and the attainment of United Nations sustainable development goals in Africa: A cross-sectional data analysis. *European Journal of Sustainable Development Research*, *7*(4), em0234. https://doi.org/10.29333/ejosdr/13576

African Union. (2016). *Continental Education Strategy for Africa 2016–2025*. http://hrst.au.int/en/sites/default/files/CESA - English-V9.pdf

Agasisti, T., Gil-Izquierdo, M., & Han, S. W. (2020). ICT Use at home for school-related tasks: what is the effect on a student's achievement? Empirical evidence from OECD PISA data. *Education Economics*, *28*(6), 601–620. https://doi.org/10.1080/09645292.2020.1822787

Agnetta, M., Kiende, G. H., & Ogulu, O. N. (2022). Influence of Teachers' Preparedness on Students' Academic Performance in Public Secondary Schools in Rwanda. *Journal of Education*, *5*(2), 53–71. https://doi.org/10.53819/81018102t5069

Ahlgren, P., Jarneving, B., & Rousseau, R. (2003). Requirements for a cocitation similarity measure, with special reference to Pearson's correlation coefficient. *Journal of the American Society for Information Science and Technology*, *54*(6), 550–560. https://doi.org/10.1002/asi.10242

Ahmad, J., Al Mamun, A., Masukujjaman, M., Mohamed Makhbul, Z. K., & Mohd Ali, K. A. (2023). Modeling the workplace pro-environmental behavior through green human resource management and organizational culture: Evidence from an emerging economy. *Heliyon*, *9*(9), e19134. https://doi.org/10.1016/j.heliyon .2023.e19134

Ahmed, I., & Ishtiaq, S. (2021). Reliability and validity: Importance in Medical Research. *Journal of the Pakistan Medical Association*, *71*(10), 2401–2406. https://doi.org/10.47391/JPMA.06-861

Akinwande, M. O., Dikko, H. G., & Samson, A. (2015). Variance Inflation Factor: As a Condition for the Inclusion of Suppressor Variable(s) in Regression Analysis. *Open Journal of Statistics*, *05*(07), 754–767. https://doi.org/10.4236/ojs .2015.57075

Alice Omariba, E. G. and H. A. (2016). Challenges Facing Teachers and Students in the Use of Instructional Technologies : A Case of Selected Secondary Schools in Kisii Central District, Kisii County. *International Journal of Information Research and Review*, *03*(11), 3129–3137.

Alshammari, A. S., Piko, B. F., & Fitzpatrick, K. M. (2022). Heliyon A sex-strati fi ed multiple regression on Jordanian adolescents ' life satisfaction using different elements of school climate. *Heliyon*, *8*(December 2021), e08693. https://doi.org/10.1016/j.heliyon.2021.e08693

Amuko, S., Miheso, M., & Ndeuthi, S. (2015). Opportunities and Challenges : Integration of ICT in Teaching and Learning Mathematics in Secondary Schools , Nairobi , Kenya. *Journal of Education and Practice*, *6*(24), 1–7.

Andoh Charles, B. (2012). Factors influencing teachers ' adoption and integration of information and communication technology into teaching : A review of the literature. *International Journal of Education and Development Using Information and Communication Technology*, *8*(1), 136–155.

Asiamah, N., Mensah, H. K., & Oteng-Abayie, E. F. (2017). General, target, and accessible population: Demystifying the concepts for effective sampling. *Qualitative Report*, *22*(6), 1607–1621. https://doi.org/10.46743/2160-3715/2017.2674

Atmowardoyo, H. (2018). Research Methods in TEFL Studies: Descriptive Research, Case Study, Error Analysis, and R & D. *Journal of Language Teaching and Research*, *9*(1), 197. https://doi.org/10.17507/jltr.0901.25

Barnett, T., Pearson, A. W., Pearson, R., & Kellermanns, F. W. (2015). Five-factor model personality traits as predictors of perceived and actual usage of technology. *European Journal of Information Systems*, *24*(4), 374–390. https://doi.org/10.1057/ejis.2014.10

Blasberg, J. S., Hewitt, P. L., Flett, G. L., Sherry, S. B., & Chen, C. (2016). The Importance of Item Wording: The Distinction Between Measuring High Standards Versus Measuring Perfectionism and Why It Matters. *Journal of Psychoeducational Assessment*, *34*(7), 702–717. https://doi.org/10.1177/0734282916653701

Bourgonjon, J., Valcke, M., Soetaert, R., & Schellens, T. (2010). Students' perceptions about the use of video games in the classroom. *Computers and Education*, *54*(4), 1145–1156. https://doi.org/10.1016/j.compedu.2009.10.022

Cakrawati, L. M. (2017). Students' perceptions on the use of online learning platforms in EFL classroom. *English Language Teaching and Technology Journal (ELT-Tech Journal)*, *1*(1), 22–30. http://ejournal.upi.edu/index.php/ELTTech/article/view/9428

Cohen, J. (1962). The statistical power of abnormal-social psychological research: A review. *Journal of Abnormal and Social Psychology*, *65*(3), 145–153. https://doi.org/10.1037/h0045186

Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications.

Cui, D., & Wu, F. (2021). The influence of media use on public perceptions of artificial intelligence in China: Evidence from an online survey. *Information Development*, *37*(1), 45–57. https://doi.org/10.1177/0266666919893411

Daoud, J. I. (2018). Multicollinearity and Regression Analysis. *Journal of Physics: Conference Series*, *949*(1). https://doi.org/10.1088/1742-6596/949/1/012009

Davis, F. D. (1986). *A technology acceptance model for empirically testing new end-user information systems: Theory and results*. Massachusetts Institute of Technology.

Davis, F. D. (1989). *Information Technology Introduction Perceived Usefulness and Perceived Ease of Use*. *September*, 319–340.

Elias, A., & Mwila, P. M. (2022). Infrastructural Challenges Influencing Academic Performance in Rural Public Secondary Schools in Iringa District , Tanzania. ResearchGate, 6(April), 16–24. Infrastructural Challenges Influencing Academic%0APerformance

Embu, C. government of. (2014). County Integrated Development Plan2013-2018. *CBPR Database - Kenya*, *September*, 3–5. www.ciel.org

Erdfelder, E., FAul, F., Buchner, A., & Lang, A. G. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods*, *41*(4), 1149–1160. https://doi.org/10.3758/BRM.41.4.1149

Ertmer, P. A. (2005). Teacher pedagogical beliefs: The final frontier in our quest for technology inteErtmer, P. A. (2005). Teacher pedagogical beliefs: The final frontier in our quest for technology integration? Educational Technology Research and Development, 53(4), 25–39. h. *Educational Technology Research and Development*, *53*(4), 25–39.

Ertmer, P. A., & Ottenbreit-Leftwich, A. T. (2010). Teacher technology change: How knowledge, confidence, beliefs, and culture intersect. *Journal of Research on Technology in Education*, *42*(3), 255–284. https://doi.org/10.1080/15391523.2010.10782551

Fagerland, M. W., & Hosmer, D. W. (2016). Tests for goodness of fit in ordinal logistic regression models. *Journal of Statistical Computation and Simulation*, *86*(17), 3398–3418. https://doi.org/10.1080/00949655.2016.1156682

Faizi, R., Chiheb, R., & El Afia, A. (2015). Students' perceptions towards using web 2.0 technologies in education. *International Journal of Emerging Technologies in Learning*, *10*(6), 32–36. https://doi.org/10.3991/ijet.v10i6.4858

Francom, G. M. (2020). Barriers to technology integration: A time-series survey study. *Journal of Research on Technology in Education*, *52*(1), 1–16. https://doi.org/10.1080/15391523.2019.1679055

Gardner, P. (2017). *The Consequences of and Factors Affecting Perceptions and Use of Technology*. https://digitalworks.union.edu/theses/32

Glen, S. (2016). Durbin Watson test & test statistic. In *From Statistics HowTo. com: Elementary Statistics for the rest of us*.

Gore, J., Lloyd, A., Smith, M., Bowe, J., Ellis, H., & Lubans, D. (2017). Effects of professional development on the quality of teaching: Results from a randomised controlled trial of Quality Teaching Rounds. *Teaching and Teacher Education*, *68*, 99–113. https://doi.org/10.1016/j.tate.2017.08.007

Gorra, V. C., & Bhati, S. S. (2016). Students' perception on use of technology in the classroom at higher education institutions in Philippines. *This Journal Article Is Available at Research Asian Journal of Education and E-Learning*, *4*(3), 89–103. https://ro.uow.edu.au/buspapers/874/

Gray, A. C., Steel, A., & Adams, J. (2020). Attitudes to and Uptake of Learning Technologies in Complementary Medicine Education: Results of an International Faculty Survey. *Journal of Alternative and Complementary Medicine*, *26*(4),

335–345. https://doi.org/10.1089/acm.2019.0319

Gray, K. C. (2001). Teachers' Perceptions of Innovation Adoption. *Action in Teacher Education*, *23*(2), 30–35. https://doi.org/10.1080/01626620.2001.10463061

Hanley, J. A. (2016). Simple and multiple linear regression: sample size considerations. *Journal of Clinical Epidemiology*, *79*, 112–119. https://doi.org/10.1016/j.jclinepi.2016.05.014

Harrell, S., & Bynum, Y. (2018). Factors affecting technology integration in the classroom. *Alabama Journal of Educational Leadership*, *5*(1), 12–18.

Hartman, R. J., Townsend, M. B., & Jackson, M. (2019). Educators' perceptions of technology integration into the classroom: a descriptive case study. *Journal of Research in Innovative Teaching & Learning*, *12*(3), 236–249. https://doi.org/10.1108/jrit-03-2019-0044

Hassan, M. U., & Aziz, A. A. (2019). (2019). Investigating the use of Computer Technology for E-learning in Pakistani Maddaris: Case of Religious Teachers. In *International Journal of Distance Education and E-Learning (IJDEEL): Vols. V-Issue I* (Issue I).

Hayes, A. F., & Montoya, A. K. (2017). A Tutorial on Testing, Visualizing, and Probing an Interaction Involving a Multicategorical Variable in Linear Regression Analysis. *Communication Methods and Measures*, *11*(1), 1–30. https://doi.org/10.1080/19312458.2016.1271116

Hejji Alanazi, M. (2019). A study of the pre-service trainee teachers problems in designing lesson plans. *Arab World English Journal (AWEJ) Volume*, *10*.

Hew, K. F., & Brush, T. (2007). Integrating technology into K-12 teaching and learning: Current knowledge gaps and recommendations for future research. *Educational Technology Research and Development*, *55*(3), 223–252. https://doi.org/10.1007/s11423-006-9022-5

Hilton III. J. (2016). A review of research on efficacy and perceptions. *Educational Technology Research and Development*, *64*(4), 573–590. https://doi.org/10.1007/s11423-016-9434-9

Hoenig, J. M., & Heisey, D. M. (2001). The Abuse of Power. *The American Statistician*, *55*(1), 19–24. https://doi.org/10.1198/000313001300339897

Hussein, Z. (2017). Leading to Intention: The Role of Attitude in Relation to Technology Acceptance Model in E-Learning. *Procedia - Procedia Computer Science*, *105*(December 2016), 159–164. https://doi.org/10.1016/j.procs.2017.01.196

Iddrisu Bariham. (2022). Senior High School Teachers' and Students' Perception about the Integration of Online Learning and Its Impact on Their Application of Technology in Teaching and Learning of Social Studies in Northern Region, Ghana. *Social Education Research*, *3*(1), 161–174. https://doi.org/10.37256/ser.3120221268

Iddrisu Bariham, Samson Rosana Ondigi, & Mueni Kiio. (2020). Preparedness of Ghanaian Senior High School Instructors for Application of Online Learning in

Social Studies Instruction amid the Covid-19 Pandemic. *Social Education Research*, *2*(1), 52–64. https://doi.org/10.37256/ser.212021554

Inan, F. A., & Lowther, D. L. (2010). Factors affecting technology integration in K-12 classrooms: A path model. *Educational Technology Research and Development*, *58*(2), 137–154. https://doi.org/10.1007/s11423-009-9132-y

Ismail, N., Kinchin, G., & Edwards, J.-A. (2017). Pilot Study, Does It Really Matter? Learning Lessons from Conducting a Pilot Study for a Qualitative PhD Thesis. *International Journal of Social Science Research*, *6*(1), 1. https://doi.org/10.5296/ijssr.v6i1.11720

Ismaili, Y. (2020). Evaluation of students' attitude toward distance learning during the pandemic (Covid-19): a case study of ELTE university. *On the Horizon*, *29*(1), 17–30. https://doi.org/10.1108/OTH-09-2020-0032

Jasik, K., Lorenc, J., Mrozowski, K., Staniszewski, J., & Walczak, A. (2016). Innovating History Education for All. Needs Assessment. In *Educational Research Institute. https://euroclio. eu/wp-content/uploads/2016/02/Lorenc-J-Mrozowski-K-Staniszewski-J-2017-IHEA-Needs-Assessment-Rep.... pdf*.

Jebungei, N. K. (2017). Educational media during microteaching in Christian Religious. *International Journal of Education and Research*, *5*(11), 21–32.

Johanson, G. A., & Brooks, G. P. (2009). Initial Scale Development : Sample Size for Pilot Studies. *Educational and Psychological Measurement*, *20*(10), 1–7. https://doi.org/10.1177/0013164409355692

Johnson, A. M., Jacovina, M. E., Russell, D. G., & Soto, C. M. (2016). *Challenges and solutions when using technologies in the classroom* (pp. 13–29).

Joo., Y. J., Lim, K. Y., & Lim, E. (2014). Investigating the structural relationship among perceived innovation attributes, intention to use and actual use of mobile learning in an online university in South Korea. *Australasian Journal of Educational Technology*, *30*(4), 427–439. https://doi.org/10.14742/ajet.681

Karakostantaki, E., & Stavrianos, K. (2021). The use of ICT in teaching religious education in primary school. *Education and Information Technologies*, *26*(3), 3231–3250. https://doi.org/10.1007/s10639-020-10417-8

Karkouti, I. M. (2021). Integrating Technology in Qatar's Higher Education Settings: What Helps Faculty Accomplish the Job. *Technology, Knowledge and Learning*, *28*(1), 279–305. https://doi.org/10.1007/s10758-021-09553-y

Katemba, C. V. (2020). Teachers' Perceptions in Implementing Technologies In Language Teaching and Learning in Indonesia. *Acuity: Journal of English Language Pedagogy, Literature and Culture*, *5*(2), 38–51. https://doi.org/10.35974/acuity.v5i2.2299

Kearney, M., Schuck, S., Aubusson, P., & Burke, P. F. (2018). Teachers' technology adoption and practices: lessons learned from the IWB phenomenon. *Teacher Development*, *22*(4), 481–496. https://doi.org/10.1080/13664530.2017.1363083

Keller, C., & Cernerud, L. (2002). Students' Perceptions of E-learning in University Education. *Journal of Educational Media*, *27*(1–2), 55–67.

https://doi.org/10.1080/1358165020270105

Khabour, O. F., & Hassanein, S. F. M. (2021). Use of vitamin/zinc supplements, medicinal plants, and immune boosting drinks during COVID-19 pandemic: A pilot study from Benha city, Egypt. *Heliyon*, *7*(3), e06538. https://doi.org/10.1016/j.heliyon.2021.e06538

Khan, M. A., Vivek, Nabi, M. K., Khojah, M., & Tahir, M. (2021). Students' perception towards e-learning during covid-19 pandemic in India: An empirical study. *Sustainability (Switzerland)*, *13*(1), 1–14. https://doi.org/10.3390/su13010057

KICD. (2015). *Curriculum guide for ICT integration in education*.

KICD. (2017). *Basic Education Curriculum Framework*.

Kilinc, A., Ertmer, P.A., Bahjcivan, E., Demirbag, M., Sonmez, A. & Ozel, R. (2016). Factors Influencing Turkish Preservice Teachers ' Intentions to Use Educational Technologies and The Mediating Role of Risk Perceptions. *Journal of Technology and Teacher Education*, *24*(February 2016), 37–62.

Kimosop, E. (2019). Use instructional resources in christian religious education(CRE) curriculum instruction in secondary schools in Kenya. *International Journal of Scientific Research and Innovative Technology*, *6*(9), 14–20.

Kinini, D. M., Ocharo, K. N., & Kariuki, P. W. (2023). Do income diversification and capital adequacy affect liquidity creation? A case study of commercial banks in Kenya. *Cogent Business and Management*, *10*(2). https://doi.org/10.1080/23311975.2023.2240082

Kiptalam, G. K., & Rodrigues, A. J. (2013). Accessibility and utilization of ICTs among secondary. *Aga Khan University - Kenya*, 246–263.

Kiptoo, P. J. (2019). *Determinants of National Information and Communication Technology Strategy Implementation : A case study of public secondary schools in Nairobi County , Kenya*.

Kisanga, D. H. (2016). Determinants of teachers' attitudes towards e-learning in Tanzanian higher learning institutions. *International Review of Research in Open and Distance Learning*, *17*(5), 109–125. https://doi.org/10.19173/irrodl.v17i5.2720

Kitari, J. W. (2020). The correlation in academic performance of public primary schools using ICTs in teaching and learning and Those that do not : A case of Matete Sub-County , Kenya. *World Journal of Pharmaceutical Research*, *9*(13), 1–15. https://doi.org/10.20959/wjpr202013-18879

Kothari, C. R. (2004). *Research methodology: Methods and techniques*. New Age International.

Kulal, A., & Nayak, A. (2020). A study on perception of teachers and students toward online classes in Dakshina Kannada and Udupi District. *Asian Association of Open Universities Journal*, *15*(3), 285–296. https://doi.org/10.1108/AAOUJ-07-2020-0047

Kunina-Habenicht, O., & Goldhammer, F. (2020). ICT Engagement: a new construct and its assessment in PISA 2015. *Large-Scale Assessments in Education*, *8*(1), 8–21. https://doi.org/10.1186/s40536-020-00084-z

Kutto, N. (2019). *Perceptions of Christian Religious Education Pre-Service Teachers and Trainers on Availability and Use of Educational Media During Micro-Teaching in Public Universities, Kenya*. *8*(33), 243.

Lai, J. W. M., & Bower, M. (2019). How is the use of technology in education evaluated? A systematic review. *Computers and Education*, *133*, 27–42. https://doi.org/10.1016/j.compedu.2019.01.010

Lawrence, J. E., & Tar, U. A. (2018). Factors that influence teachers ' adoption and integration of ICT in teaching / learning process. *Educational Media International*, *3987*, 1–27. https://doi.org/10.1080/09523987.2018.1439712

Lee, K. T. (2002). Effective Teaching in the Information Era: Fostering an ICT based Integrated Learning Environment in Schools. *Asia-Pacific Journal for Teacher Education & Development*, *5*(1), 21–45.

Lemay, D. J., Doleck, T., & Bazelais, P. (2019). Context and technology use: Opportunities and challenges of the situated perspective in technology acceptance research. *British Journal of Educational Technology*, *50*(5), 2450–2465. https://doi.org/10.1111/bjet.12859

Lim, C. P., & Chai, C. S. (2008). Teachers' pedagogical beliefs and their planning and conduct of computer-mediated classroom lessons. *British Journal of Educational Technology*, *39*(5), 807–828. https://doi.org/10.1111/j.1467-8535.2007.00774.x

Lowther, D. L., Inan, F. A., Daniel Strahl, J., & Ross, S. M. (2008). Does technology integration "work" when key barriers are removed? *Educational Media International*, *45*(3), 195–213. https://doi.org/10.1080/09523980802284317

Lumpkin, A., Achen, R., & Dodd, R. (2015). Focusing Teaching on Students: Examining Student Perceptions of Learning Strategies. *Quest*, *67*(4), 352–366. https://doi.org/10.1080/00336297.2015.1082143

Lust, G., Elen, J., & Clarebout, G. (2012). Adopting webcasts over time: the influence of perceptions and attitudes. *Journal of Computing in Higher Education*, *24*(1), 40–57. https://doi.org/10.1007/s12528-011-9052-9

Luu, T. M. V. (2022). Readiness for Online Learning: Learners' Comfort and Self-Directed Learning Ability. *International Journal of TESOL & Education*, *2*(1), 213–224. https://doi.org/10.54855/ijte.222113

Magak, M. G. (2016). *Effect of Constructivist Instructional Methods On Learner Achievement In Biology In Secondary Schools In Homa Bay County, Kenya* (Issue August).

Mahaboob, B., Praveen, J. P., Appa Rao, B. V., Harnath, Y., Narayana, C., & Prakash, G. B. (2020). A study on multiple linear regression using matrix calculus. *Advances in Mathematics: Scientific Journal*, *9*(7), 4863–4872. https://doi.org/10.37418/amsj.9.7.52

Mailizar, Almanthari, A., Maulina, S., & Bruce, S. (2020). Secondary school mathematics teachers' views on e-learning implementation barriers during the COVID-19 pandemic: The case of Indonesia. *Eurasia Journal of Mathematics, Science and Technology Education*, *16*(7). https://doi.org/10.29333/EJMSTE/8240

Makgato, M. (2012). Identifying Constructivist Methodologies and Pedagogic Content Knowledge in the Teaching and Learning of Technology. *Procedia - Social and Behavioral Sciences*, *47*, 1398–1402. https://doi.org/10.1016/j.sbspro.2012.06.832

Malekani, A. A. (2018). Access to, use and challenges of ICTs in secondary schools in Tanzania: a study of selected secondary schools in Morogoro Municipality. *Information Impact: Journal of Information and Knowledge Management*, *9*(2), 44–57. https://doi.org/10.4314/iijikm.v9i2.4

Manduku, J. G., Kosgey, A. K., & Sang, H. (2012). Adoption and use of ICT in enhancing management of public secondary schools: A survey of Kesses zone secondary schools in Wareng district of uasin Gishu county, Kenya. *IMSCI 2012 - 6th International Multi-Conference on Society, Cybernetics and Informatics, Proceedings*, 31–36.

Manning, M., Garvis, S., Fleming, C., & Wong, G. T. W. (2017). The relationship between teacher qualification and the quality of the early childhood education and care environment. *Campbell Systematic Reviews*, *13*(1), 1–82. https://doi.org/10.4073/csr.2017.1

Maphosa, V. (2021). Factors Influencing Student's Perceptions Towards E-Learning Adoption During COVID-19 Pandemic: A Developing Country Context. *European Journal of Interactive Multimedia and Education*, *2*(2), e02109. https://doi.org/10.30935/ejimed/11000

Marcus, B. Pietro. (2019). Book review: Hilton III, J. (Ed.). (2018). Teaching Religion Using Technology in Higher Education. New York, NY: Routledge. 212 pp. ISBN: 9781138087224. *FIRE: Forum for International Research in Education*, *5*(1), 154–162. https://doi.org/10.32865/fire20195128

Mazana, M. Y., Montero, C. S., & Casmir, R. O. (2018). Investigating Students' Attitude towards Learning Mathematics. *International Electronic Journal of Mathematics Education*, *14*(1), 207–231. https://doi.org/10.29333/iejme/3997

McCaw, Z. R., Lane, J. M., Saxena, R., Redline, S., & Lin, X. (2020). Operating characteristics of the rank-based inverse normal transformation for quantitative trait analysis in genome-wide association studies. *Biometrics*, *76*(4), 1262–1272. https://doi.org/10.1111/biom.13214

Ministry of Education. (2001). *National report on the development of education in Kenya presented at the International Conference on education, 46th session, Geneva, 5-7th September 2001*.

Ministry of Education. (2018). *Republic of Kenya Vision 2030 Medium Term plan II education and training*.

Mohajan, H. K. (2017). Two Criteria for Good Measurements in Research: Validity and Reliability. *Annals of Spiru Haret University. Economic Series*, *17*(4), 59–82. https://doi.org/10.26458/1746

Muathe, S., Waithaka, S. T., & Malongo, K. I. (2019). The moderating effect of organizational characteristics on the relationship between Information Technology integration and performance of selected public hospitals in Kenya. *Journal of Business and Management Sciences*, *7*(2), 3359–3367. https://doi.org/10.24297/ijmit.v15i0.8429

Mugenda, O. M., & Mugenda, A. G. (2003). *Quantitative and qualitative approaches*. Nairobi: Acts Press.

Mumtaz, S. (2000). Factors affecting teachers' use of information and communications technology: A review of the literature. *Journal of Information Technology for Teacher Education*, *9*(3), 319–342. https://doi.org/10.1080/14759390000200096

Mungeria, J. K. (2021). *Influence of Collaborative Learning Strategy on Learner Achievement in Accounting in Secondary Schools in Igembe Central Sub-county, Kenya*. http://erepository.uonbi.ac.ke/handle/11295/157275

Munyao, J. N., Mwania, J. M., & Mwinzi, J. (2017). Factors influencing the choice of Christian Religious Education by secondary school students in Makueni Sub-county, Makueni County-Kenya. *International Journal of Education and Research*, *5*(12), 31–44. www.ijern.com

Murundu, H. H., Okwara, M. O., Otienoh, R., & Murundu, Z. O. (2017). Factors Influencing Selection and Use of Media for Christian Religious Education Teaching and Learning. *Research on Humanities and Social Sciences*, *7*(8), 29–36.

Murungi, V. M., Kibaara, T. M., & Mwaniki, T. M. (2017). Impact of implementing information technology on teaching in public secondary schools in Mbeere sub-county, Embu County, Kenya. *IJRDO-Journal of Educational Research*, *2*(8), 190–214.

Musdi, E., Dewi Agustyani, A. R., & Tasman, F. (2019). Students'perception toward flipped classroom learning. *Journal of Physics: Conference Series*, *1317*(1). https://doi.org/10.1088/1742-6596/1317/1/012132

Mustafa, M. B. (2015). One Size Does Not Fit All: Students' Perceptions about Edmodo at Al Ain University of Science & Technology. *Journal of Studies in Social Sciences*, *13*(2), 135–160.

Mwai, S. W. (2015). *Application of Instructional technologies in teaching and learning in public secondary schools in Kiambu sub-county*.

National Education Sector Plan. (2015). *Mininstry of Education , Science and Technology: National Education Sector Plan*.

Naveed, Q. N., Qureshi, M. R. N., Tairan, N., Mohammad, A. H., Shaikh, A., Alsayed, A. O., Shah, A., & Alotaibi, F. M. (2020). Evaluating critical success factors in implementing E-learning system using multi-criteria decision-making. *PLoS ONE*, *15*(5), 1–25. https://doi.org/10.1371/journal.pone.0231465

Niemi, H. M., & Kousa, P. (2020). A Case Study of Students' and Teachers' Perceptions in a Finnish High School during the COVID Pandemic. *International Journal of Technology in Education and Science*, *4*(4), 352–369. https://doi.org/10.46328/ijtes.v4i4.167

Njoroge, R. W., & Kibaru, F. (2012). Implementing Quality E-learning : Which Way for Higher Education Institutions in Kenya ? *In Proceedings of the World Conference on Educational Multimedia, Hipermedia and Telecommunicatios*, 1707–1712.

Nyamwaya, M. O., Miricho, M. & Bitok, J. (2020). Influence of Staff Training on Sales Control in F & B on Financial Performance of Classified Restaurants in Nairobi County , Kenya Nyamwaya Ondieki Margaret , Dr . Moses Miricho ISSN : 2706-6592 Influence of Staff Training on Sales Control in F & B on Fin. *Journal of Hospitality and Tourism Management*, *3*(2), 42–63.

Nyankanga, M. E., Joshua, B. N., Wekesa, W. N., Ongaga, E., & Orina, F. (2013). The changing trends in the development of teacher education in Kenya : The role of the Teacher ' s Service Commission . *Research on Humanities and Social Sciences*, *3*(19), 82–86.

Nzomo, C., Rugano, P., Njoroge Mungai, J., & Gitonga Muriithi, C. (2023). Inquiry-based learning and students' self-efficacy in Chemistry among secondary schools in Kenya. *Heliyon*, *9*(1), e12672. https://doi.org/10.1016/j.heliyon.2022.e12672

Oluoch, D. (2016). Strategies of Enhancing ICT Use in the Delivery of Management Services in Public Secondary Schools in Siaya County in Kenya. *European Scientific Journal, ESJ*, *12*(28), 375. https://doi.org/10.19044/esj.2016 .v12n28p375

Osborne, J. W., & Waters, E. (2003). Four assumptions of multiple regression that researchers should always test. *Practical Assessment, Research and Evaluation*, *8*(2), 2002–2003.

Otieno, M.A., & Ochieng, J. A. (2020). Impact of 100 Per Cent Transition Policy on Public Secondary Schools in Machakos Sub- County, Kenya: Focusing on Coping Strategies. *Journal of Eduation and Practice*, *11*(24), 69–77. https://doi.org/10.7176/jep/11-24-08

Ouma, G., Awuor, F., & Kyambo, B. (2013). E-Learning Readiness in Public Secondary Schools in Kenya. *European Journal of Open, Distance and e-Learning*, *16*(2), 97–110. http://www.eurodl.org/materials/contrib/ 2013/Ouma _et_al.pdf

Oyediran, W. O., Omoare, A. M., Owoyemi, M. A., Adejobi, A. O., & Fasasi, R. B. (2020). Prospects and limitations of e-learning application in private tertiary institutions amidst COVID-19 lockdown in Nigeria. *Heliyon*, *6*(11). https://doi.org/10.1016/j.heliyon.2020.e05457

Özgün, Z., & Saritepeci, M. (2021). Determination of the factors affecting teachers' perceptions of classroom management competence in technology assisted courses. *Technology, Pedagogy and Education*, *30*(5), 673–691. https://doi.org/10.1080/1475939X.2021.1956579

Papanastasiou, E. C., Zembylas, M., & Vrasidas, C. (2003). Can computer use hurt science achievement? The USA results from PISA. *Journal of Science Education and Technology*, *12*(3), 325–332.

Park, I., Kim, D., Moon, J., Kim, S., Kang, Y., & Bae, S. (2022). Searching for New Technology Acceptance Model under Social Context: Analyzing the Determinants of Acceptance of Intelligent Information Technology in Digital Transformation and Implications for the Requisites of Digital Sustainability. *Sustainability (Switzerland)*, *14*(1). https://doi.org/10.3390/su14010579

Peace, T. A. (2020). Integration of the 21 st Century Technologies in Religious Education Methodologies in Secondary Schools in Uganda. *Humanities and Social Science*, *1*(4), 267–279. https://doi.org/10.47310/jiarjhss.v01i04.008

Perera, R. H. A. T., & Abeysekera, N. (2022). Factors affecting learners' perception of e-learning during the COVID-19 pandemic. *Asian Association of Open Universities Journal*, *17*(1), 84–100. https://doi.org/10.1108/AAOUJ-10-2021-0124

Peytcheva-Forsyth, R., Yovkova, B., & Aleksieva, L. (2018). Factors affecting students' attitudes towards online learning - The case of Sofia University. *AIP Conference Proceedings*, *2048*(December). https://doi.org/10.1063/1.5082043

Piper, B., Jepkemei, E., & Kibukho, K. (2015). Kenya ' s ICT Policy in Practice : The Effectiveness of Tablets and E-readers in Improving Student Outcomes Kenya ' s ICT Policy in Practice : The Effectiveness of Tablets and E-readers. *Forum for International Research in Education*, *2*(1), 1–18.

Popovici, A., & Mironov, C. (2015). Students' Perception on Using eLearning Technologies. *Procedia - Social and Behavioral Sciences*, *180*(November 2014), 1514–1519. https://doi.org/10.1016/j.sbspro.2015.02.300

Ramnarain, U., & Ramaila, S. (2018). The relationship between chemistry self-efficacy of South African first year university students and their academic performance. *Chemistry Education Research and Practice*, *19*(1), 60–67. https://doi.org/10.1039/C7RP00110J

Ray, R. (2020). Dr. Rashawn Ray, The Brookings Institution 1. *Enhancing Patent Diversity for America's Innovators.*, 1–7.

Redempta, K., & Elizabeth, M. (2012). "An E-Learning Approach to Secondary School Education": E-Readiness Implications in Kenya. *Journal of Education and Practice*, *3*(16), 142–148. http://www.iiste.org/Journals/index.php/JEP/article/view/3707%5Cnhttp://www.iiste.org/Journals/index.php/JEP/article/viewFile/3707/3756

Rogers, E. M. (1995). *Diffusion of Innovations*.

Sabates, R., Akyeampong, K., Westbrook, J., & Hunt, F. (2011). *The hidden crisis : Armed conflict and education School Drop out : Patterns , Causes , Changes and Policies*.

Salem, A. B. M., Mikhalkina, E. V, & Nikitaeva, A. Y. (2019). Establishment of smart education system in modern universities: concept, technologies and challenges. *International Journal oF Education and Information Technologies*,

13(February), 180–188.

Sanderson, E., & Windmeijer, F. (2016). A weak instrument F-test in linear IV models with multiple endogenous variables. *Journal of Econometrics*, *190*(2), 212–221. https://doi.org/10.1016/j.jeconom.2015.06.004

Saoke, V. O., Musafiri, C. M., Ndwiga, Z. N., & Githaiga, P. W. (2023). The christian religious education teachers' attitudes toward the five-stage lesson plan framework in Kenya: A gender-based analysis. *Heliyon*, *9*(8), e19104. https://doi.org/10.1016/j.heliyon.2023.e19104

Saoke, V. O., Ndwiga, Z. N., Githaiga, P. W., & Musafiri, C. M. (2022). Determinants of awareness and implementation of five-stage lesson plan framework among Christian Religious Education teachers in Meru County, Kenya. *Heliyon*, *8*(11). https://doi.org/10.1016/j.heliyon.2022.e11177

Saptono, A., Wibowo, A., Widyastuti, U., Narmaditya, B. S., & Yanto, H. (2021). Entrepreneurial self-efficacy among elementary students: the role of entrepreneurship education. *Heliyon*, *7*(9), e07995. https://doi.org/10.1016/j.heliyon.2021.e07995

Sari, F. M., & Wahyudin, A. Y. (2019). Undergraduate students' perceptions toward blended learning through instagram in english for business class. *International Journal of Language Education*, *3*(1), 64–73. https://doi.org/10.26858/ijole.v1i1.7064

Sawyer, L. (2017). *Perception and practice : The relationship between teacher perceptions of technology use and level of classroom technology integration*.

Schoolnet, E. (2013). Survey of schools: ICT in education. Benchmarking access, use and attitudes to technology in European schools. *Liége, Belgium: European Union. Doi*, *10*, 94499.

Seddon, F., & Biasutti, M. (2009). "Evaluating a music e-learning resource: The participants" perspective'. *Computers and Education*, *53*(3), 541–549. https://doi.org/10.1016/j.compedu.2008.12.011

Selim, H. M. (2003). An empirical investigation of student acceptance of course websites. *Computers and Education*, *40*(4), 343–360. https://doi.org/10.1016/S0360-1315(02)00142-2

Shan, M., Yang, Z., Sun, Z., Yang, Y., Cheng, Q., & Pan, Y. (2023). Association between platelet to lymphocyte ratio and depression and symptom severity among adults in the United States: A cross-sectional study. *Heliyon*, *9*(9), e20127. https://doi.org/10.1016/j.heliyon.2023.e20127

Shpeizer, R. (2019). Towards a successful integration of project-based learning in higher education: Challenges, technologies and methods of implementation. *Universal Journal of Educational Research*, *7*(8), 1765–1771. https://doi.org/10.13189/ujer.2019.070815

Shrestha, N. (2020). Detecting Multicollinearity in Regression Analysis. *American Journal of Applied Mathematics and Statistics*, *8*(2), 39–42. https://doi.org/10.12691/ajams-8-2-1

Simba, N. O., Agak, J. O., & Kabuka, E. (2016). Impact of discipline on academic performance of pupils in public primary schools in Muhoroni Sub-County, Kenya. *Journal of Education and Practice*, *7*(6), 164–173. http://proxy.mul.missouri.edu/login?url=https://search.proquest.com/docview/1826524639?accountid=14576

Singh, A. S. (2017). Common Procedures for Development, Validity and Reliability of a Questionnaire. Swaziland: Department of AEM, Faculty of Agriculture, University of Swaziland. *International Journal of Economics, Commerce and Management*, *5*(5), 790–801.

Situma, J. (2016). Methods used by teachers to teach Christian religious education in secondary schools in Kimilili in Bungoma County, Kenya. *British Journal of Education*, *4*(1), 1–8.

Stevens, J. P. (2012). *Applied multivariate statistics for the social sciences*. Routledge.

Swallow, M. (2017). The Influence of Technology on Teaching Practices at a Catholic School. *Journal of Catholic Education*, *20*(2), 154–176. https://doi.org/10.15365/joce.2002072017

Taber, K. S. (2017). The Use of Cronbach's Alpha When Developing and Reporting Research Instruments in Science Education. *Research in Science Education*, *48*(6), 1273–1296. https://doi.org/10.1007/s11165-016-9602-2

Tchombe, T. (2008). *Classroom Events: Methods, Techniques and Psychological Correlates*. Yaounde: Vita Press.

Tenakwah, E. S., Tenakwah, E. J., Amponsah, M., Eyaa, S., Boateng, E., & Okhawere, N. (2022). Adoption of Sustainable Technologies during Crisis: Examining Employees' Perception and Readiness across Cultures. *Sustainability (Switzerland)*, *14*(8), 1–20. https://doi.org/10.3390/su14084605

Teo, T., Huang, F., & Hoi, C. K. W. (2018). Explicating the influences that explain intention to use technology among English teachers in China. *Interactive Learning Environments*, *26*(4), 460–475. https://doi.org/10.1080/10494820.2017.1341940

Theng Lau and Hua Sim. (2008). Exploring the extent of ICT adoption among Secondary school teachers In Malaysia. *International Journal of Computing and ICT Research*, *2*(2), 19–36.

Ting, N. C. (2013). Classroom Video Project: An Investigation on Students Perception. *Procedia - Social and Behavioral Sciences*, *90*(InCULT 2012), 441–448. https://doi.org/10.1016/j.sbspro.2013.07.113

Tondeur, J., van Braak, J., Ertmer, P. A., & Ottenbreit-Leftwich, A. (2017). Erratum to: Understanding the relationship between teachers' pedagogical beliefs and technology use in education: a systematic review of qualitative evidence (Educational Technology Research and Development, (2017), 65, 3, (555-575), 10.1007/s11423-016-94. *Educational Technology Research and Development*, *65*(3), 577. https://doi.org/10.1007/s11423-016-9492-z

Tou, N. X., Kee, Y. H., Koh, K. T., Camiré, M., & Chow, J. Y. (2020). Singapore teachers' attitudes towards the use of information and communication

technologies in physical education. *European Physical Education Review*, *26*(2), 481–494. https://doi.org/10.1177/1356336X19869734

Tuan, N. A., Hue, T. T., Lien, L. T., Van, L. H., Nhung, H. T. T., & Dat, L. Q. (2022). Management factors influencing lecturers' research productivity in Vietnam National University, Hanoi, Vietnam: A structural equation modeling analysis. *Heliyon*, *8*(9), e10510. https://doi.org/10.1016/j.heliyon.2022.e10510

United Nation. (2019). The Secretary-General's strategy on new technologies. In *UN Chronicle* (Vol. 55, Issue 4). https://doi.org/10.18356/f9699d05-en

van Ginkel, J. R., & Kroonenberg, P. M. (2014). Analysis of Variance of Multiply Imputed Data. *Multivariate Behavioral Research*, *49*(1), 78–91. https://doi.org/10.1080/00273171.2013.855890

Vaportzis, E., Clausen, M. G., & Gow, A. J. (2017). Older adults perceptions of technology and barriers to interacting with tablet computers: A focus group study. *Frontiers in Psychology*, *8*(OCT), 1–11. https://doi.org/10.3389/fpsyg.2017.01687

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 425–478.

Wanjala, M. Y., Iravo, M. A., Odhiambo, R., & Shalle, N. I. (2017). Influence of Monitoring Tools on Project Performance in Kenyan State Corporations. *European Scientific Journal, ESJ*, *13*(19), 354. https://doi.org/10.19044/esj.2017.v13n19p354

Wickens, T. D., & Keppel, G. (2004). *Design and analysis: A researcher's handbook*. Pearson Prentice-Hall Upper Saddle River, NJ.

Wijaya, T. T., & Weinhandl, R. (2022). Factors Influencing Students' Continuous Intentions for Using Micro-Lectures in the Post-COVID-19 Period: A Modification of the UTAUT-2 Approach. *Electronics (Switzerland)*, *11*(13). https://doi.org/10.3390/electronics11131924

Wilkerson, M. H., Andrews, C., Shaban, Y., Laina, V., & Gravel, B. E. (2016). What's the Technology For? Teacher Attention and Pedagogical Goals in a Modeling-Focused Professional Development Workshop. *Journal of Science Teacher Education*, *27*(1), 11–33. https://doi.org/10.1007/s10972-016-9453-8

Williamson, K. M., & Muckle, J. (2018). Students' Perception of Technology Use in Nursing Education. *CIN - Computers Informatics Nursing*, *36*(2), 70–76. https://doi.org/10.1097/CIN.0000000000000396

Wood, E., Mueller, J., Willoughby, T., Specht, J., & Deyoung, T. (2005). Teachers' Perceptions: barriers and supports to using technology in the classroom. *Education, Communication & Information*, *5*(2), 183–206. https://doi.org/10.1080/14636310500186214

Yadav, N., Gupta, K., & Khetrapal, V. (2018). Next Education: Technology Transforming Education. *South Asian Journal of Business and Management Cases*, *7*(1), 68–77. https://doi.org/10.1177/2277977918754443

Yildiz Durak, H. (2023). Conversational agent-based guidance: examining the effect of chatbot usage frequency and satisfaction on visual design self-efficacy, engagement, satisfaction, and learner autonomy. *Education and Information Technologies*, *28*(1), 471–488.

Yudiawan, A., Sunarso, B., Suharmoko, Sari, F., & Ahmadi. (2021). Successful online learning factors in covid-19 era: Study of islamic higher education in west papua, indonesia. *International Journal of Evaluation and Research in Education*, *10*(1), 193–201. https://doi.org/10.11591/ijere.v10i1.21036

Zohrabi, M. (2013). Mixed method research: Instruments, validity, reliability and reporting findings. *Theory and Practice in Language Studies*, *3*(2), 254.

APPENDICES

Appendix A: Principal's Interview Guide

Introduction

This interview seeks to establish measures school administration implements to support teachers and students in the uptake of educational technologies. Your response will be highly appreciated and treated with utmost confidentiality. ***(A tick (√) will be used where necessary to answer the questions)***

Section A: Demographic Information

1. Gender: Male [ ] Female [ ]

2. Age: 31 – 40 years [ ] 41 – 50 years [ ]
   51 – 60 years [ ] Above 60 years [ ]

3. Teaching Experience
   6 – 10 years [ ] 11- 15 years [ ]
   16 - 20 years [ ] 21- 25 years [ ]
   Above 25 years [ ]

4. How many years have you served as the principal in **this** school?
   Less than 1 year [ ] 1 – 5 years [ ]
   6 – 10 years [ ] 11 – 15 years [ ]
   16 - 20 years [ ] Above 20 years [ ]

5. Educational Qualification
   PhD [ ] Master's Degree [ ]
   Bachelor's Degree [ ] Degree through PGDE [ ]
   Diploma [ ]

6. Teaching subjects.....

Section B: School Support

7. Have you ever attended any training/workshop on the integration of educational technologies? Yes [ ] No [ ]
   If yes, how did the training help you to integrate educational technologies in your school? (*Probe to check principals have been trained as gate passes for integration*).
8. Does the school have a computer laboratory? If so, how would a CRE teacher access it? (*Probe to find information on access to educational technologies*).
9. a) Does the school organize any training for teachers on educational technologies to improve their professional development? Yes [ ] No [ ]

b) If yes, please state for what courses and type of courses, If no, why? (*Probe to get information on Teacher training and professional development*)

10. Is your school able to set aside funds for the acquirement/purchase of educational technologies for learning purposes? (*Probe to determine how the educational technologies are acquired*).
11. Would you say that the government has supported your school in terms of the allocation of funds for the purchase of educational technologies? (*Probe to check on government provision measures*).
12. How does your school acquire educational technologies for their usage? (*Probe on school measures*).
13. Are there administrative support measures that you have implemented to adequately motivate teachers to use educational technologies in class? (*Probe on school support measures*).
14. What other ways have you put in place to support CRE teachers and students in the uptake of educational technologies in your school? (*Probe on motivation measures).*

Appendix B: Questionnaire for CRE Teachers

This questionnaire seeks to find out teachers' perceptions towards uptake of educational technologies in CRE. Please complete each section as instructed. The information is highly confidential.

Section A: Demographic Information ***(Use a tick (√) where necessary to answer the questions)***

1. Gender: Male [ ] Female [ ]

2. Age: Below 30 years [ ] 31- 40 years [ ]
   41 – 50 years [ ] Above 50 years [ ]

3. For how many years have you been teaching CRE subject?

   Less than 1 year [ ] 1 – 5 years [ ] 6 – 10 years [ ]

   11 – 15 years [ ] 16 – 20 years [ ] above 20 years [ ]

4. What is your highest level of professional Qualification?

   PhD [ ] Master's Degree [ ] Bachelor's Degree [ ]

   Degree through PGD [ ] Diploma [ ]

Section B: Technology Usage

5. During your teacher training did you receive any computer-technology-related courses that prepared you for teaching CRE?

   Yes [ ] No [ ]

6. How often does this school organize training for CRE teachers on the use of educational technologies in the teaching and learning process? Once a year [ ]
   Once a term [ ] I have never seen [ ]

7. How often do you use the following educational technologies in teaching CRE? ***(Please tick (√) one box only in each row, where: 5- Always 4- Often 3- Sometimes 2- Rarely 1- Never)***

Educational technologies	**1**	**2**	**3**	**4**	**5**
Computers					
Projectors					
Internet					
Smart Phones					
Laptops					
Google					
Virtual learning environments e.g., Zoom, Google Meet.					
Social Learning Platforms e.g., CRE teachers WhatsApp					

8. What is your opinion on the following statements in terms of **using** educational technologies in teaching CRE? ***(Please tick one box only in each row, where: 5- Strongly Agree, 4- Agree 3- Undecided, 2- Disagree and 1- Strongly Disagree)***

Statement	**1**	**2**	**3**	**4**	**5**
I have enough time to learn about educational technologies in CRE.					
I have adequate skills to use educational technologies in CRE.					
There are educational technologies for teaching CRE in this school					
I have support from my school administration to use educational technologies in teaching CRE.					
I can cope with the rapid technological changes in teaching CRE.					
I just like using educational technologies in teaching CRE.					
There are trainings and workshops in this school to motivate me to use technology in CRE.					
I am comfortable/ confident using technology in teaching CRE					

Section C: Teachers' Perceptions

9. What is your opinion regarding the following statements in terms of teaching CRE with educational technologies as instructional resources? (***In the range of 1-5 indicate using a tick in each row, where: 5-Strongly Agree, 4- Agree, 3-Undecided, 2-Disagree and 1- Strongly Disagree)***

Statement	**1**	**2**	**3**	**4**	**5**
Using educational technologies makes my teaching interesting in CRE.					
Educational technologies improve the presentation of my teaching materials in CRE.					
I find technology useful as it makes my tasks easier in CRE.					
Technology makes me as a teacher more creative and innovative in teaching CRE.					
Technology can enhance students' learning by increasing their motivation in CRE.					
Technology helps me organize my work as a teacher in CRE.					
Educational technologies make me more productive in teaching CRE.					
Using technology to teach saves my time and effort in CRE.					
I feel technology may replace my work as a CRE teacher.					
I would like to learn and use educational technologies in teaching CRE.					
I prefer my own method of teaching (conventional method) CRE.					
Technology is helpful to me as a teacher in preparation of learning materials in CRE.					
Using educational technologies improves my job performance as a CRE teacher.					

Thank you for participating in this Survey.

Appendix C: Questionnaire for CRE Students

Introduction

The purpose of this questionnaire is to find out students' perceptions towards the uptake of educational technologies in CRE. The information provided is highly confidential and will be used for academic purposes only. ***Kindly use a tick (√) to answer the questions where necessary.***

Section A: Demographic Information.

1. Gender: Male [ ] Female [ ]

2. Age: Below 14 years [ ] 14 – 15 years [ ]
   16 – 17 years [ ] Above 17 years [ ]

Section B: Technology Usage

3. How often do you use the following educational technologies for learning either in school or at home? ***(Please tick one box only in each row, where: 5- Always 4-Often 3-Sometimes 2-Rarely 1- Never)***

Educational Technologies	**1**	**2**	**3**	**4**	**5**
Computers					
Internet					
Smart Phones					
Laptops					
Google					
Virtual Learning environments e.g., Zoom, Google Meet etc.					
Social Learning Platforms e.g., WhatsApp.					

4. To what extent do you think the outlined educational technologies are useful when used in teaching and learning CRE? ***(Please tick one box only in each row, where: 5- Extremely useful, 4- Useful, 3- Not sure, 2- Slightly useful, and 1- Not useful at all)***

Educational Technologies	**1**	**2**	**3**	**4**	**5**
Computers					
Smart Phones					
Internet					
Laptops					
Google					
Virtual Learning Environments e.g., Zoom, Google Meet.					
Social Learning Platforms e.g., WhatsApp etc.					

5. What is your opinion on the following statements (**factors**) in terms of using educational technologies in learning CRE? ***(Please tick one box only in each row, where 5-Strongly Agree, 4- Agree, 3- Undecided, 2- Disagree and 1- Strongly disagree***

Statement	**1**	**2**	**3**	**4**	**5**
I have enough time to learn about educational technologies in CRE.					
I have adequate skills to use educational technologies in CRE.					
There are educational technologies for learning CRE in my school					
I have support from the school administration and my teachers to use technology in CRE.					
I can cope with the rapid technological changes in learning CRE.					
I just like using educational technologies in my learning CRE.					
There are workshops/ trainings in my school to motivate me to use technology in CRE					

Section C: Students' Perceptions

6. Respond to the following statements to the best of your knowledge in terms of using educational technologies in teaching and learning of CRE? ***(Please tick one box only in each row, where 5-Strongly Agree, 4- Agree, 3- Undecided, 2- Disagree and 1- Strongly disagree)***

Statement	**1**	**2**	**3**	**4**	**5**
Using technology makes my learning more interesting and enjoyable in CRE.					
Educational technologies enhance my own learning in CRE thus motivating me.					
Technology helps me to be more creative and innovative in CRE.					
Technology enables me to understand concepts better in CRE through accessing more learning materials					
Technology can improve the way my CRE teacher presents teaching and learning materials.					
Educational technologies make me productive in learning CRE.					
Using educational technologies to learn CRE saves me time and effort					
I would like to learn more and use educational technologies in CRE					
I prefer my CRE teacher's way of teaching (conventional method)					
I find technology useful as it makes my work easier in CRE.					
I find technology useful for leisure activities e.g., interacting through CRE WhatsApp etc.					

Thanks for participating in this Survey

Appendix D: Budget

S/N	Item	Activity	Quantity	Cost per Unit	Total (Kshs)
1.	Concept Paper	Printing	6	100	600
2.	Proposals (department, school, and BPS)	Printing	22	550	12100
3.	Research Instruments Teachers' questionnaires Students Questionnaires. Interview guides	Printing	 40 450 10	 50 30 30	 2000 13500 300
4.	Pilot Study	Testing instruments			5000
5.	Research Permit	Applying	1	1000	1000
6.	Reports	Printing	6	550	3300
7.	Final Thesis	Printing	6	550	3300
8.	Data analysis	analysis			30000
9.	Transportation				40,000
10.	Accommodation				30,000
11.	Meals				25000
12.	Books	Records	3 @500		1500
13.	Pens	Writing	20@30		600
14.	Miscellaneous expenses				20000
Total					**188,600**
	Contingencies (10% of the total)				18,860
Grand Total					**207,060**

Appendix E: Research Authorization Letter

MINISTRY OF EDUCATION

State Department of Early Learning and Basic Education

Telegrams: "Provedu". Embu
Telephone: Embu 31711
Fax: 30956
E-mail: cde.embu@yahoo.com
When replying please quote:

OFFICE OF THE
COUNTY DIRECTOR OF EDUCATION
EMBU COUNTY
P o Box 123-60100
EMBU

Ref: EBC/GA/32/1/Vol. V/91

Date: 25th January, 2023

Rachael Wanjiku Gitiha
UNIVERSITY OF EMBU

RE: RESEARCH AUTHORIZATION

Reference is made to your letter dated 4th January, 2023.

This office acknowledges receipt of your research authorization to carry out research on "**Teachers and Students Perceptions and the Uptake of Educational Technologies in Public Secondary Schools in Embu, Kenya"** for a period ending 4th January, 2024.

This office has no objection and therefore wishes you success in this undertaking and requests prospective participants/respondents to accord you cooperation or support you may require.

GRACE MUGU
For: County Director of Education
EMBU COUNTY

Copy to:

The Principal Secretary, MOE-**NAIROBI**
The Secretary/CEO, NACOSTI – **NAIROBI**
The County Commissioner – **EMBU COUNTY**
The Sub-county Directors of Education – **EMBU COUNTY**

Appendix F: Research Permit

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: 763608

Date of Issue: 04/January/2023

RESEARCH LICENSE

This is to Certify that Ms.. RACHAEL WANJIKU GITIHA of University of Embu, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Embu on the topic: TEACHERS' AND STUDENTS' PERCEPTIONS AND THE UPTAKE OF EDUCATIONAL TECHNOLOGIES IN PUBLIC SECONDARY SCHOOLS IN EMBU COUNTY, KENYA for the period ending : 04/January/2024.

License No: NACOSTI/P/23/23007

763608

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

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