INFLUENCE OF INFORMATION AND COMMUNICATION TECHNOLOGY INTEGRATION IN SCHOOL OPERATIONS ON STUDENTS' ACADEMIC ACHIEVEMENTS IN SECONDARY SCHOOLS IN KAMUKUNJI CONSTITUENCY IN NAIROBI COUNTY, KENYA

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DECLARATION

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

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DEDICATION

This project is dedicated to my parents (Mr and MrsRANDA).

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ABBREVIATIONS AND ACRONYMS

BOM: Boards of Management

ICT: Information and CommunicationTechnology

KCSE: Kenya Certificate of SecondaryEducation

KICD: KenyaInstitute of Curriculum Development

KNEC: Kenya National Examination Council

LMS: LearningManagement Systems

NACOSTI: National Commission forScience, Technology &Innovation

PTA: Parents Teachers' Associations

SIS: Student Information Systems

SPSS: Statistical Product and Service Solutions

TAT: Technology Acceptance Theory

ABSTRACT

Integrating ICT in curriculum of every secondary school is very significant because it assists in streamlining the school operations. The government of Kenya has taken the decision to provide public secondary schools with ICT resources so as to increase the level of ICT literacy among students and generally improve academic achievement. However, the existing studies have failed to show how ICT integration influences students' academic achievement. The study's purpose was to assess the influence of integrating ICT in school operations on students' academic achievement in KCSE among secondary schools in Kamukunji Constituency, Kenya. Specifically, the study intended to assess how ICT integration in teaching process, in management of examinations, in managing teaching and learning resources and in managing students'information on students' academic achievement in every secondary school in Kamukunji Constituency, Kenya. The study employed survey research design. The research targeted 1871 form four students, 408 secondary school teachers, 13 principals and 1 sub county education director in Kamukunji sub-county. The student's sample was 134. The researcher used questionnaire which was the major data collection tool. The study conducted multiple regression analysis to establish how independent variables predict the dependent variables. The study revealed that integrating ICT in the process of teaching (regression coefficient of 0.742 and p-value of 0.000), integrating ICT in managing examinations (regression coefficient of 0.618 and p-value of 0.023), ICT integration in learning resources' management (regression coefficients of 0.824 and p-value of 0.003) and integrating ICT in managing students' data (regression coefficients of 0.769and p-value of 0.000) substantially influenced students' academic achievement in secondary schools in Kamukunji Constituency. The study concluded that integrating ICT in teaching process, examination management, learning resources' management and students' data management significantly affected the students' academic achievement in secondary schools in Kamukunji Constituency, Kenya.The study recommends that ministry of education in collaboration with teacher's service commission should implement regular and comprehensive professional development programs to train teachers in effective ICT integration techniques in the classroom.

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

Strategic investment in Information Communication Technology (ICT) is critical in meeting the dynamic education needs of society. Thus, every government have a responsibility of ensuring that each individual has access to quality education as affects economic development (Grimus, 2020). Quality education refers to a type of education that enables learners to advance know-how, competencies, and attitudes needed to thrive in their personal and professional lives (Al-Ababneh&Alrhaimi, 2020). Over the years, provision of high-quality education has led to a high quality of human capital, where its effects trickle down to other sectors of the economy like infrastructure, business, wellbeing, natural resources and the environment transport and communication, security, and government service, amongst other development areas (Leicht, Heiss&Byun, 2018). This is why the governments allocate a lot of money in their budgets for financing education (Aina, 2013). The education ministries in many countries are continually working to enhance the overall education quality so as to enhance the human capital capabilities of their workforces and increase overall productivity. Among the strategies to improve education in the 21st century involves incorporating technology in various aspects of education including classroom teaching process and overall education administration (Mbugua, Mbugua, Kiboss, &Tanui, 2015).

Information and communication technology (ICT) integration refers to as the utilization of technologies in the process of teaching, management of exams, management of education resources and management of students' data. Aina (2013) defines the ICT

integration as the process of determining the appropriate placement and method of incorporating technology into the educational environment. When applied in education, information and communication technology (ICT) enhances student engagement and helps to better retain knowledge. This is because modern tools allow for the delivery of the same information in a number of different ways, each of which may be modified to meet the needs of a given learner (Ramorola, 2013). According to Grimus (2020), the success in ICT integration into the environment of learning relies on the capability of the instructors to revolutionize learning approaches, effectively integrate technology with teaching methods, establish interactive and socially engaged classrooms, and enhance collaborative learning experiences.

The ICT integration is a fundamentally new shift in pedagogy from the conventional method of knowledge transmission to a more dynamic and interactive form of learning which involves engaging students in ICT-linked learning environments and utilizing shared learning resources to foster independent and lively learning experiences (Aslan& Zhu, 2018). As per Suleman, *et al*., (2017), the ICT integration in teaching process, management of exams, management of learning and teaching resources and management of students' data has been established to affect the students' academic achievement in high schools. The academic achievement of students is the assessment of how well students have performed in a variety of academic areas. Normative test scores, performance in classroom, and rates of graduation are the three primary metrics that teachers and education administrators use to evaluate academic performance of students. There are various aspects of ICT integration which influence students' academic achievement.

The ICT integration in teaching process refers to the incorporating information and communication technology in wide-ranging ideologies into pedagogy and administration approaches used for classroom instruction (Habibi, Yusop, &Razak, 2020). Globally in Indonesia, Habibi, *et al*. (2020) argues that ICT enhances how lesson materials are presented through PowerPoint presentations, enhances comprehension during presentation of lessons, makes teaching livelier for learners and positively changes the association between the learners and teachers in secondary schools. In Canada, Saxena (2017) argued that integrating ICT in Canadian secondary schools has streamlined teaching process and this in turn have been improving students' academic achievement by 60 percent. In Africa, Adegbite (2017) noted that a unit change in ICT integration in teaching process significantly improved the achievement of students by 66 percent in secondary schools of Oyo State, Nigeria.Regionally in Rwanda, Munyengabe, Yiyi, Haiyan and Hitimana (2017) found that integration of ICT tools in teaching process not only significantly benefits teachers but also aids learners in their everyday learning activities, enabling more targeted instruction that caters to students' strengths and weaknesses by improving the analysis of achievement data. In Kenya, Oichoe (2018) demonstrated that incorporating ICT into education enhances students' access to diverse educational materials such asonline textbooks, multimedia content, and interactive simulations which make learning more engaging and accessible, catering to different learning styles. In Kamukunji constituency however, there was no study conducted linking the ICT integration teaching process to students' academic achievement.

On the other hand, ICT integration in examination management which refers to using ICT in managing examination activities such as exam setting, timetabling and analysis in

schools, makes it possible for teachers to assess and evaluate the students effectively during examination period. Globally, most secondary schools in federal democratic republic of Nepal, ICT is an efficient instrument tool for integrating and automating exam setting, timetabling and analysis as it saves time that teachers can use in focusing on revision with students. This has positively affected students' academic accomplishment (Rana&Rana, 2020). Integrating ICT in examination management positively reduces administrative burdens and the time required for exam preparation which allows teachers to allocate more time to helping students academically (Bai, Mo, Zhang, Boswell &Rozelle, 2016). In Africa, Mafenya (2016 noted that online assessment systems can provide immediate feedback to students, helping them understand their strengths and weaknesses. Regionally in Rwanda, Paul, Kabanda and Andala(2020) established that ICT integration streamlines the assessment process, making it more efficient and effective by providing immediate feedback to students which helps them to identify areas where they need improvement and lead to better learning outcomes. In Kenya, Jeruto, Soi, Bett and Ngure (2022) found that integrating ICT in exam management makes it effective for teachers to track students' academic progress which identifies areas for improvement in an effort to enhance students' academic achievement. In Kamukunjiconstituency though, there were no studies conducted in relation to effect of integrating ICT in managing examinations on students' academic achievement.

Further, ICT could be integrated in provision of electronic teaching and learning materials which refers to use of ICT to provide digital learning materials published in digital format including electronic textbook, electronic workbook and instructive videos. Globally in China, it was established that provision of electronic materials enables

students to access learning and teaching materials for them to improve their academic achievement (Lin & Chen, 2017).In Africa, Agyei (2021) found that ICT integration provides students with easy access to a wide range of electronic teaching and learning materialswhich enhances their learning experience, increases engagement and better understanding of the subject matter.Regionally in Uganda, Charles, *et al*., (2021) found that integrating ICT in provision of electronic teaching and learning materials is improved by awareness programs for computer at colleges for training teachers. The programs give teachers the opportunity to get the knowledge and skills necessary to efficiently utilize ICT in high schools. In Kenya, Galadima (2015) established that integration of ICT approaches in teaching in secondary schools have significantly improved the students' academic achievements. However, in Kamukunji constituency, there was no study conducted linking the integration of ICT in provision of electronic teaching and learning materials to students' academic achievement.

Further, ICT integration in students' data management entails using ICT systems for managing all the student's data such as enrollment data, fees records, students' performance data, books allocations and also student health data (Blau& Shamir-Inbal, 2017). Globally in China, Rafi, JianMing and Ahmad (2019) argued that ICT integration in students' data management affects students' academic achievement as it saves time for teachers and school management and hence, they can focus on strategies meant for enhancing academic achievement of students.In Africa,Padayachee(2017) established that ICT systems assist secondary schools maintain accurate and up-to-date records of student information, including grades, attendance, and performance which ensure that students are evaluated fairly and areas for improvement are identified. Regionally in

Tanzania, Mwanyesya (2019) established that ICT integration in students' data management enables school authorities to keep more consistent records and to exchange pertinent information with students, teachers, and parents which aids in identifying areas where students might be facing difficulties, enabling the provision of focused assistance and resources to enhance their academic achievement. However, in Kamukunji constituency, there was no study conducted linking the ICT integration in students' data management to students' academic achievement

Integrating ICT in school operations in Kenya is taken as a definitive solution towards the resolution of challenges facing education. The Kenyan government has put a considerable emphasis on ensuring ICT integration in every secondary school (Mwiluli, 2018). Kenya has actively pursued the development of multiple attempts toward the establishment of an ICT policy. The compilation of all of these interventions has resulted in the production of the National Access Report and the formulation of the e-government Strategy (Chepkorir&Kandiri, 2018). According to the document outlining Kenya's ICT for education plan, there are a number of obstacles in the way of gaining accessibility to and making usage of ICT in the country which include a low percentage of grid extension, high levels of poverty, and recurrent power outages. The government acknowledges the beneficial role that ICT play in the efforts of achieving Kenya vision 2030, which calls for the country to become a middle-level economy (Mutisya, Mwania&Mulwa, 2017).

The Kenyan government has published a number of rules and guidelines that regulate the ICT incorporation. Integration of ICT into the environment of secondary schools is seen as a component of the comprehensive technological modernization of school administration and instruction, and the digital government (Chepkorir&Kandiri, 2018).

Various studies have linked ICT integration and students' academic achievement in Kenya. For instance, Mwiluli (2018) found that ICT integration in administration and integrating ICT in teaching substantially affected achievement of students in high schools in Makueni-County. Moreover, Muema (2018) established that using ICT resources in the teaching process positively influenced students' academic achievement. This also agrees with Mbugua, *et al*., (2015) whose study found that integrating ICT in teaching was a crucial element in enhancing the secondary school student's performance in Nakuru County.

In Kamukunji constituency, every secondary school has integrated ICT in teaching process, examination management, management of teaching and learning resources and students' data management (Hussein, Abayo, &Mugambi, 2019). However, the accessibility and availability of ICT is still inadequate in spite of the support that secondary schools in integrating ICT have received from the government (Mwiluli, 2018). Despite the integration of ICT most schools, the student's academic achievement has been dismally since their performance have been low as compared to other Nairobi sub-counties. For instance, in terms of KCSE performance in 2020, the averages of Kamukunji sub-county were 3.456 which was lower than the 3.612 of Starehe Sub-County, 3.736 of Westlands sub-county and a national mean score at 3.633. In terms of percentage of quality grades in 2020, Kamukunji sub-county had less than 10% of quality grades in national tally (KNEC, 2020). In addition, the ICT integration has been low because of lack of training among teachers for integrating ICT properly and lack of appropriate software. Moreover, the link between ICT integration and students' academic achievement have not been established. It is therefore important to establish how ICT

integration have influenced the academic achievement of students in Kamukunji Constituency, Kenya.

1.2 Statement of the Problem

Integrating ICT in curriculum of every secondary school is very significant because it assists in streamlining the school operations(Mwiluli, 2018). The Kenyan government in collaboration with other stakeholders in education sector have made efforts to promote ICT integration in the process of teaching including ICT teacher training programs, supply of ICT equipment and construction of computer laboratories. There has been an increased emphasis on the usage of technology in education, with many schools in Kenya integrating ICT into their teaching and learning processes. However, the effectiveness of this integration on academic achievement have not been explicitly established by previous studies. This is the research gaps that the study sought to bridge.

In Kamukunji Constituency, despite public secondary schools integrating ICT on school operations like learning and teaching, examination management, learning resources' management and students' data management, there is little evidence establishing link between ICT integration and students' academic achievement. Some of the existing studies exhibited contextual, conceptual and methodological gaps. For instance,Muema (2018) only examined integratingICT in teaching of mathematics omitting other school operations. The research also had contextual gap as it was carried out in Garrisa county and could not be generalized to cover the cases of secondary schools in Kamukunji Constituency. Further, a study by Musau(2020) exhibited a conceptual gap as it only

examined integration of ICT in teaching biology. The current research hence intended to bridge these gaps by examining the influence ofICT integration on students' academic achievement in secondary schools in Kamukunji Constituency, Kenya.

1.3 Purpose of the Study

The purpose of the study was to assess the influence of ICT integration in school operations on students' academic achievement in secondary schools in Kamukunji Constituency in Nairobi County, Kenya.

1.4 Specific Objectives

Specifically, the study sought:

i. To examine how ICT integration in teaching process affects students' academic achievement in secondary schools in Kamukunji Constituency.
ii. To assess the how integrating ICT in management of examinations influences students' academic achievement in secondary schools
iii. To determine how ICT integration in managing teaching-learning resources influences students' academic achievement in secondary schools
iv. To establish the effect of ICT integration in students' data management on students' academic achievement in secondary schools

1.5 Research Questions

The research questions were:

i. In what extent has integrating ICT in teaching process influenced students' academic achievement in secondary schools in Kamukunji Constituency, Kenya?

ii. How does ICT integration in examination management influence students' academic achievement in secondary schools in Kamukunji Constituency, Kenya?

iii. In what extent has ICT integration in learning resources' management influence students' academic achievement in secondary schools in Kamukunji Constituency, Kenya?

iv. How does ICT integration in students' data management influence students' academic achievement in secondary schools in Kamukunji Constituency, Kenya?

1.6 Significance of the Study

The study findings could be beneficial to the policy makers in Ministry of Education as it may help in formulation and reviewing of policies meant to enhance integrating ICT in the operations of every Kenyan secondary school. The recommendations from the study would result to the development of an efficient policies for guiding the ICT integration in the operations of every secondary school in Kenya.

The study may also be significant to principals as it highlights how integrating ICT in teaching process, management of exams and students' data management affects students' academic achievement. This may enable them to develop strategies to guarantee efficient ensure ICT integration in all school operations. The study might also be of benefit to the teaching staff as it may provide an insight on shortcomings in teaching standards and hence emphasize on the necessity of integrating ICT in the process of teaching.

The Kenya Institute of CurriculumDevelopment (KICD) may use study for facilitating further enhancements of training curriculum for teachers to equip likely teachers and

principals with necessary ICT skills for efficiently integrating in teaching process, managing examinations, learning resources' management and students' data regulations.

The study may be significant to school Boards of Management (BOM) and Parents Teachers' Associations (PTA) as they formulate upcoming strategic plans, secure funding for acquiring ICT resources, and make various management choices regarding the effective use of ICT. This may ensure every public secondary school in Kenya have integrated ICT in all school operations.

The study is anticipated to add to and strengthen the existing literature as it established that incorporating ICT in secondary schools substantially influenced students' academic performance. The literature would be beneficial to future researchers as it be used as s foundation for conducting further studies on how ICT integration influences students' academic achievement in every secondary school.

1.7 Limitations of the study

The study faced difficulties in the process of collecting data for the research. First, some of the respondents were unwilling to provide information for fear of portraying negative image about them. The researcher addressed this by assuring the participants that the information they provided was solely used for academic purposes and their identities were kept confidential. The study was also limited to the extent that the participants were willing to give credible data for the research. To address this challenge, the researcher tested for reliability and validity of the research tools.

1.8 Delimitation of the study

The focus of the study was on influence of ICT integration in school operationson students' academic achievement in secondary school in Kamukunji Constituency, Kenya. The study investigated the influence of integrating ICT in teaching process, managing examinations, learning resources' management and students' data management on students' academic achievement insecondary schools in Kamukunji Constituency. The study restricted itself to only public secondary schools in Kamukunji Constituency. The study also restricted itself to school heads, teaching staff and learners for data collection. The data was only obtained utilising a questionnaire and interview. These were used as the complement each other in obtaining information about ICT integration and students' academic achievement.

1.9 Basic assumptions of the study

The study was founded on an assumption that

i. Every secondary school in Kamukunji Constituency have integrated ICT in the school operations.
ii. Every participant would take part and offer credible information for the research.
iii. The views of the participants would be an adequate representation of the entire population.

1.10 Definition of significant terms

The operational terms definitions used throughout the study are:

ICT integration: Refers to the process of incorporating technology into various aspects of education through seamless use of computers, software, networks, and other digital technologies to improve student learning.

ICT Integration in education: This refers to the usage of computer-founded communications into the consistent instructional processes within classrooms.

ICT integration in examination management: This refers to use of ICT in management of information linked to setting, scheduling and analysis of exam data in schools.

ICT integration in students' data management: This pertains to the utilization of Information and Communication Technology (ICT) for the administration of student data, encompassing activities like storage, tracking, and the straightforward monitoring of information. Additionally, it facilitates the sharing of pertinent information among school authorities, students, teachers, and parents.

ICT integration in teaching process: This refers to use of ICT linked resources like power point presentation, teaching animations and educational videos during lesson delivery to improve students' comprehension. It involves the use of digital resources, such as computers, smartphones, tablets, software, and the internet, to support and enrich teaching and learning activities.

Information and Communication Technology (ICT): This refers to technologies used to manage, process, communicate, and store information. ICT includes various hardware, software, networks, and services that play a crucial role in modern-day communication and information handling.

Learning resources' management: This refers to use of ICT in making it easy to access digital learning materials like e-textbooks, e-workbooks and educational videos.

Students' academic achievement: This refers to the measurement of student performance across various academic subjects. In this study, the students' academic achievement was assessed using exam performance, percentage of quality grades, university transition rate and participation in co-curricular activities.

1.11 Organization of the Study

There were five chapters in this study. Chapter one was introduction covering study background, problem's statement, study purposes, objectives, study questions, limitation, basic assumption, delimitations and terms definitions. Chapter two presents the reviews of literature and chapter three presents the research methods. Further, chapter four highlights analysis of data and finally, chapter five covered summary, conclusion and recommendation.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Introduction

This chapter two contains a review of related literature on the topic under study and includes literature review on concept of on students' academic achievement, Information Communication Technology (ICT) integration in teaching process, integrating ICT in managing examinations, ICT integration in learning resources' management and ICT integration in students' data management. Lastly, literature summary, theory and concept frameworks are highlighted.

2.2 Concept of ICT Integration and Academic Achievement

Education is considered an essential requirement, and academic achievement is placed quite high on the national conversation. As a result, educators and policymakers are putting a lot of effort into evaluating students, being accountable for their actions, and addressing other issues connected to education (Albert &Dahling, 2016). One of the initiatives that policy makers have considered to improve education is ICT integration. Integrating ICT in every secondary school is the incorporation of ICT into the teaching and learning process to enhance student engagement, promote active learning, and improve educational outcomes (Habibi, Yusop, &Razak, 2020). The concept involves utilizing technology tools like computers, smartphones, interactive whiteboards, and software applications to support the teaching process. ICT integration in every secondary school has become essential because it equips students with the IT skills essential to succeed in the 21st-century working environment. It also enables teachers to deliver more engaging and interactive lessons, leading to better student outcomes (Avbarefe,

2021).However, the above authors failed to explicitly show the link between the integrating ICT and students academic achievement.

As per Tus (2020), the academic achievement of a student is the measurement of the performance of student across a variety of academic areas. Academic achievement relates to what the student has learned or what abilities the student has understood, and it is typically quantified via evaluations such as consistent test scores, performance evaluations, and records of examinations. Academic achievement is the progression of students from one phase to another or the achievement of a score of problems ranging from the medium position to the greater one (Chen, & Yang, 2019). However, the above authors failed to explicitly show the link between the integrating ICT and students' academic achievement.

According to Basri, Alandejani and Almadani (2018), standardized achievement tests scores, teacher judgments of academic achievement, and grades on report cards are some of the ways that academic achievement of children can be evaluated. Standardized achievement exams are objective devices that evaluate students' progress in school by measuring their mastery of predetermined content areas like reading and writing (Hornby & Blackwell, 2018). Educators assess students' progress through various methods such as consistent scores in tests, participation in class and rate of graduation. Standardized achievement exams only look at a small subset of academic skills, but teacher assessment methods allow for ratings on a wider range of academic tasks than are assessed on standardized success tests (Chepkorir&Kandiri, 2018). However, the existing literature had gaps as it omitted percentage of quality grades and higher education transition rate as indicators of students' academic achievement.

Students' efforts in the classroom are directed toward the ultimate end of their education that is, their own personal growth and development. The complex unit known as achievement is comprised of a number of components, one of which is learning processes encouraged by the school (Kagochi, 2022). These learning processes entails the revolution of a given state, into a new state, and they are accomplished with the integrity of a dissimilar unit that contains elements both cognitive and structural (BalTaştan, *et al*., 2018). Academic success includes intelligence, character, ambition, skills, preferences, study skills, personality, and teacher-student interaction (Mbugua, *et al*., 2015). This study links the on students' academic achievement with the information and communication technology integration in school operations.

One factor that can impact academic achievement is socio-economic status. Students coming from rich households attend higher quality schools and have access to educational resources, giving them an advantage in academic achievement. Haider and Hussain (2014) found that teacher qualifications and experience were positively associated with student achievement in mathematics and science. However, there were also concerns about teacher absenteeism and lack of training, which could undermine education quality. In regard to interventions to improve achievement academically, there have been efforts to increase access to technology in schools. However, the study could not be generalized to show how ICT integration influences students' academic achievement.

Umar and Hassan (2015) revealed that ICT integration in schools of Malaysia have enhanced the academic achievement of students. Bai, Mo, Zhang, Boswell and Rozelle (2016) established that ICT integration in teaching programme, examination management

and provision of electronic materials positively and significantly impacts on academic achievement of student in Rural Schools in China. In Saudi Arabia, Basri, Alandejani and Almadani (2018) established a significant association amongst ICT integration and academic achievement as integration of ICT led to enhanced students' achievement. In Nigeria, the integration of ICT has helped both students and teachers to meet the worldwide obligation to replace old-style teaching approaches with technology-linked teaching and learning tools. ICT integration is considered one of the major elements in transforming and improving academic achievement in Nigeria schools (Avbarefe, 2021). Galadima (2015) found that using ICT initiatives in teaching in every secondary school in Mbale municipality have significantly improved the academic achievement.

2.3 ICT Integration in Teaching Process and Students' Academic Achievement

The information and communication technology (ICT) integration in teaching process refers to the incorporating technology in general principles into teaching approaches utilized for classroom instructions (Habibi, Yusop, &Razak, 2020). Integrating ICT in education is not about technology but teaching. It is the inventiveness of the instructor that contributes to the meaningful delivery of the lesson. The goal of ICT integration is to enhance the teaching quality and equipping students with modern skills. Using information and communication technology (ICT) increases the likelihood that students will acquire the essential abilities to thrive in the modern global economy. This is because of the fact that ICT can help students in the development of their competencies, increase their morale and expand their know-how (Cakici, 2016).

According to Lawrence and Tar (2018), the capability of teachers for structuring learning in new approaches to appropriately combine technologies with teaching methods, and to

inspire co-operative interaction as well as collaborative learning and group work is important for effective integration of ICT in schools. Research done by Ghavifekr, et al., (2014) on integrating ICT in education in Malaysia, established that ensuring success in ICT integration depends on the manner in which teachers integrate ICT in process of teaching to boost intellectual skills of students and also ensure better learning outcomes.Though, the research had a contextual gap as it was carried out in Malaysia and could not be generalized for case of Kamukunji constituency in Kenya

A study in Nigeria done by Avbarefe (2021) on efficiency of integrating ICT in educational system, found that ICT is an authoritativeinstrument for improving teaching and is a catalyst for fundamental reform in current school practices and a veritable vehicle for preparing students for the future. It was recommended that so as to enhance the usage of ICT in teaching, there is need for government to change and enhance the teachers' beliefs about ICT integration in teaching. However, the study has looked at the ICT integration in education system, it has not highlighted how it effects on students' academic achievement.

Mensah, *et al*. (2023) assessed how usage ICT on students' achievement in emerging country. The research established that limited internet connectivity and teachers' attitudes towards integrating ICT in class pose challenges for students' usage of IT tools in the process of learning. The ICT success in SCS education relies heavily on the accessibility of ICT resources both at school and, at times, in students' homes. Research done by Mbugua, *et al*. (2015) found that students' academic achievement is positively influenced by ICT integration in teaching since it is a crucial constituent in enhancement of students'

academic achievement. However, these studies did not establish effect of integrating ICT in teaching on academic achievement of students.

Oichoe (2018) looked at the influence of incorporating Information and Communication Technology (ICT) into the educational process at secondary schools in Kenyenya Sub-County, Kisii County, Kenya. The study utilized questionnaire for collecting data from the respondents. The research found that integrating ICT in process of teaching have significantly influenced students' academic achievement in every secondary school. This is linked to the fact that learners had the opportunity to complete assignments independently using online tools, which allowed them to dedicate more time to exam preparation. The study recommended that the school administration enhance ICT infrastructure to ensure easy and frequent access for students. This, in turn, would enable students to acquire IT skills, empowering them for solving fundamental issues on their own. However, the study did not establish how ICT integration in teaching affects students' academic achievement.

2.4 ICT Integration in Examination Management and Students' Academic Achievement

The information and communication technology (ICT) integration in examination management which refers to using ICT in managing examination activities in schools, made it possible for teachers to examine and evaluate the students effectively during examination period (Mwiluli, 2018). Blau and Shamir-Inbal (2017) argues that ICT is an efficient tool for integrating and automating various activities of examination system as it saves time that teachers can use in focusing on revision with students. Having easy accessibility to ICT facilities, like the Excel software program, guarantees precision,

timeliness, and efficiency in managing the entire examination process, as it permits the smooth flow of data and the implementation of suitable risk surveillance systems. Considering the tedious tasks of setting, grading, computation, and rating students in schools, automatic set exams can make student monitoring and marking easier utilizing computationally built solutions (Kaiiali, *et al*., 2016).

According to Ahuja (2016), the software that was designed for the purpose of exam management in schools is intended for use by school officials, and it can play the function of an assessment for principals, teachers and learners. The ICT usage, particularly the spreadsheet application Excel, made it possible for administrators and teachers to more easily handle data and keep accurate records, which in turn improves the management of schools and individual classrooms. Management information systems contain modules that enable the automated entry of exam results for students. The connecting of computers to photocopiers makes it possible for staff members to produce copies of documents on demand, which can simplify the process of bulk photocopying (Blau&ShamirInbal, 2017).

Research carried out by Mwiluli (2018) on influence of ICT integration on academic achievement in public secondary schools in Makueni County Kenya, found that in majority of schools have long since adopted the use of computers and linked software for the administration of tests. It was also made evident, schools rely heavily on ICT for examination scheduling, exam analysis, and examination records management. ICT integration was also established to enhance the level of analysis on examinations while saving time, allowing deadlines to be met. However, the study has failed to explain how

ICT integration in various schools' operation could be linked to on students' academic achievement.

Another study conducted by Oyier, Odundo, Lilian and Wangui (2015) on how integrating ICT in managing exams affects students in every private secondary school in Nairobi County, established that use of electronic media for keeping tabs on class attendance and upkeep is made possible by the automation of timetabling whereas in management of exams, it allows for analysis of results analysis and producing reports for board of management, guardians, school departments, class teachers and students. Teachers may now easily save students' assessment results in a statement bank, where they can make any changes and incorporate the statements into reports that are automatically generated and sent home to parents. However, the study has failed to explain how ICT integration in various schools' operation could be linked to on students' academic achievement.

2.5 ICT Integration in Managing Teaching and Learning Resources and Students' Academic Achievement

The information and communication technology (ICT) integration in managing teaching and learning resources which refers to refers to the utilizing of digital technology and materials to ease the process of generating, sharing, and organizing educational content. This approach has gained popularity in recent years due to the widespread availability of technology and the benefits it offers in regards to efficiency, accessibility, and engagement (Arthur-Nyarko, Agyei&Armah, 2020). According to Arthur-Nyarko, et al., (2020), among the key merits of ICT integration in managing teaching and learning resources is the ability to create and distribute materials quickly and easily. With digital

tools like learning management systems (LMS), teachers can easily upload and share materials with students, without the need for printing and distributing physical copies. This saves time and resources, and also ensures that materials can be accessed by students regardless of their location.

Klement, Dostál and Marešová (2014) argues that for the purposes of implementing distant learning via e-learning materials could be defined as being wholly electronic, hyper-text collaborating learning resources. They are made so that students can navigate their way around a curriculum with relative ease, largely because to a hyperlinked text layout and a variety of multimedia elements meant to engage as many of the student's senses as possible. ICT integration in managing teaching and learning resources can also enable personalized learning experiences. By leveraging data and analytics tools, teachers can monitor student progress and tailor their teaching to address individual needs and preferences. This contributes to the establishment of a captivating and efficient learning setting since students are inclined to feel motivated and committed to their own learning process (Lin & Chen, 2017).

Alenezi (2020) argued that information and Communication Technology (ICT) has transformed the way teaching and learning resources are managed which has made it easier to create, store, access, and share educational resources. With ICT, teachers can create digital content such as presentations, videos, e-books, and podcasts. These resources can be easily edited, updated, and shared with students and other teachers. In addition, Sejzi and Arisa (2013) noted that learning management systems (LMS) platforms allow teachers to manage and deliver digital content to their student and provide features such as assignment submission, grading, and communication tools.

However, these studies failed to establish how integrating ICT in learning resources' management affects students' academic achievement.

A study conducted by Alenezi (2020) on the role played by electronic teaching resources for improving behavior in regard to teaching and learning in Saudi Arabia, found that the ICT integration in learning resources' management have played a crucial role in improving teaching and students' performance. This could be linked to the fact that the integration of ICT allows for easy and immediate access to a wealth of learning resources such as electronic books, online journals, and interactive multimedia materials, which can aid students in their studies. The study also established that students' achievements and teachers' efficacy both improve in tandem with expanded access to and usage of online learning resources. However, the study failed to examine how integrating ICT in learning resources' management affects students' academic achievement.

Another study was conducted by Muteti (2020) on how animations in electronic learning resources affects performance of students in physics among targeted high schools in Nairobi, found that it's no secret that the embedded animations on the Physics helped students better grasp the information contained therein. That was evident in how well they did on the tests given. Animations helped students better understand and retain Physics material. However, the study also failed to establish how integrating ICT in learning resources' management affects students' academic achievement. The study also focused on one subject which cannot be generalized to cover the case of other subjects in secondary schools.

2.6 ICT Integration in Students' Data Managementand Students' Academic Achievement

According to Blau and Shamir-Inbal, 2017), ICT integration in students' data management can positively affect academic achievement of students. The use of ICT in data management allows for more accurate and efficient collection, analysis, and dissemination of data, which can provide teachers and administrators with timely and relevant information to support student learning. The ICT usage has substantially facilitated the enhancement of educational systems' data collection. It has also increased the accessibility of these statistics to educators, parents, and the general public via central school administration sites and, in various nations, by direct access to central database by educators (Oyier, *et al*., 2015).

According to Rosman and Buřita (2014), schools can improve their existing minimal levels of use by implementing ICT-linked student tests monitoring and appearance systems, and by developing in-house broadcasting software. The use of ICT helps students form a positive, personal connection to the process of self-evaluation. Technological advancements have greatly aided the process of gathering students' data in schools. In addition, the centralized school management site has made these records more accessible to teachers, parents, and the general public (Mensah, 2016). However, the study doesn't explicitly establish how ICT integration in students' data management could directly be linked to students' academic achievement.

ICT integration in students' data management can help schools and educational institutions to be more efficient, efficient and responsive to the students' needs. It can also provide students with greater access to their own academic records and enable

teachers to personalize instruction based on individual student needs (Rosman&Buřita, 2014). Student Information Systems (SIS) allow schools to manage student information, such as attendance records, grades, and schedules. SIS software can be used to automate administrative tasks and provide real-time access to student data. Student portals enable students to conveniently access their individual academic records, including information about their grades, attendance, and class schedules. Portals can also be used to communicate with teachers, submit assignments, and access course materials (Salam, Zeng, Pathan, Latif&Shaheen, 2018).

Research done by Oboegbulem and Ugwu (2013), in Nigerian South Eastern States, found that ICT's impact on systems management has altered the character of secondary school administration by making it possible for nearly all those involved in the institution's operations, whether within or outside, to participate in its management and use its resources. The study also found that ICT Integration in students' data management helps in tracking a student progress becomes easier because some systems are designed to alert the institute when a student misses three or more periods in a row. However, the study failed to examine how integrating ICT in students' data management affects students' academic achievement in every secondary school.

Another study conducted by Mensah (2016) on integrating ICT in managing data of students at Cape Town University, established that ICT has been recognized by administrators at the University of Cape Coast as an essential and effective medium for improving the management of day-to-day operations. Data on students is captured, stored, analyzed, retrieved, and disseminated using a wide variety of ICT tools across both administrative and academic departments. However, the study did not link the

integrating ICT in students' data management and on students' academic achievement in every secondary school.

2.7 Summary of Literature Review

Different studies were reviewed in relation to ICT integration in school operations and students' academic achievement. However, the existing studies exhibited both contextual and conceptual gaps. Though Mensah (2016) looked at integrating ICT in managing student's data at the university but the study did not link integrating ICT in students' data regulation and on students' academic achievement in secondary schools. Avbarefe (2021) also looked at the ICT integration in education system, but the study did not highlight how it effects students' academic achievement. Musau (2020) only focused one subject (Biology) instead of the overall achievement of the students and Mwiluli (2018) was based in Makueni County and could not be generalized to cover every county in Kenya. The knowledge gap is that none of these studies could be generalized for the case of Kamukunji Constituency. Additionally, Muema (2018) only examined the integration of ICT in teaching and learning of mathematics omitting other school operations. The study also exhibited contextual gaps as it was done in Garrisa county and could not be generalized to cover the cases of secondary schools in Kamukunji Constituency. This study hence sought to bridge these gaps by assessing how integrating ICT in school operations influenced academic achievement of students in secondary schools in Kamukunji Constituency, Kenya.

2.8 Theoretical Framework

The research was founded onsystems theorythat was postulated by Ludwig von Bertalanffy in 1940s. Systems theory states that a system is a collection of interconnected

and interdependent components or elements that work together to attain a shared goal or function. views an educational system as an interconnected network of components, where variations in one part could affect the entire system (Kumaran, Hassabis& McClelland,2016). It emphasizes the need for holistic planning and considers the interactions between various elements of the educational system, such as curriculum, teachers, students, and resources. Systems theory is an interdisciplinary field that studies complex systems and their interactions. It provides a framework for understanding and analyzing various phenomena and systems in terms of their components, relationships, and behaviors (Hespanha, 2018).

The fundamental assumption of systems theory posits that a complicated system comprises numerous smaller subsystems, and it is the interplay among these smaller subsystems that gives rise to the complex system as we understand it. Systems theory maintains that certain foundational concepts and principles can be universally employed across various domains, even if these domains have developed independently (Bales, 2017). This foundational premise is pivotal in systems theory, as it is this rationale that empowers professionals such as social workers and psychologists to utilize systems theory effectively for the betterment of those they serve (Hespanha, 2018).

The theory was pertinent to the research as it highlighted how ICT integration in school operations as part of the education system could affect students' academic achievement. The theory can be useful in guiding the planning and process of making decisions to implement ICT initiatives in various school operations. The theory can help schools to make informed decisions about ICT integration, taking into account the likely benefits and difficulties linked to the usage of technology in teaching and learning. Systems

theory provides a framework for planning, implementing, and evaluating ICT integration in education and can help educators make informed decisions about technology use in the classroom in an effort to improve students' academic achievement.

2.9 Conceptual Framework

Conceptual framework is a model that represents association amongst the study variables and reveals the association graphically (Kelley & Knowles, 2016). From the conceptual framework, the dependent variable on students' academic achievement while the independent variable includes integrating ICT in teaching process, integrating ICT in management of examinations, ICT integration in learning resources' management and ICT integration in students' data management.

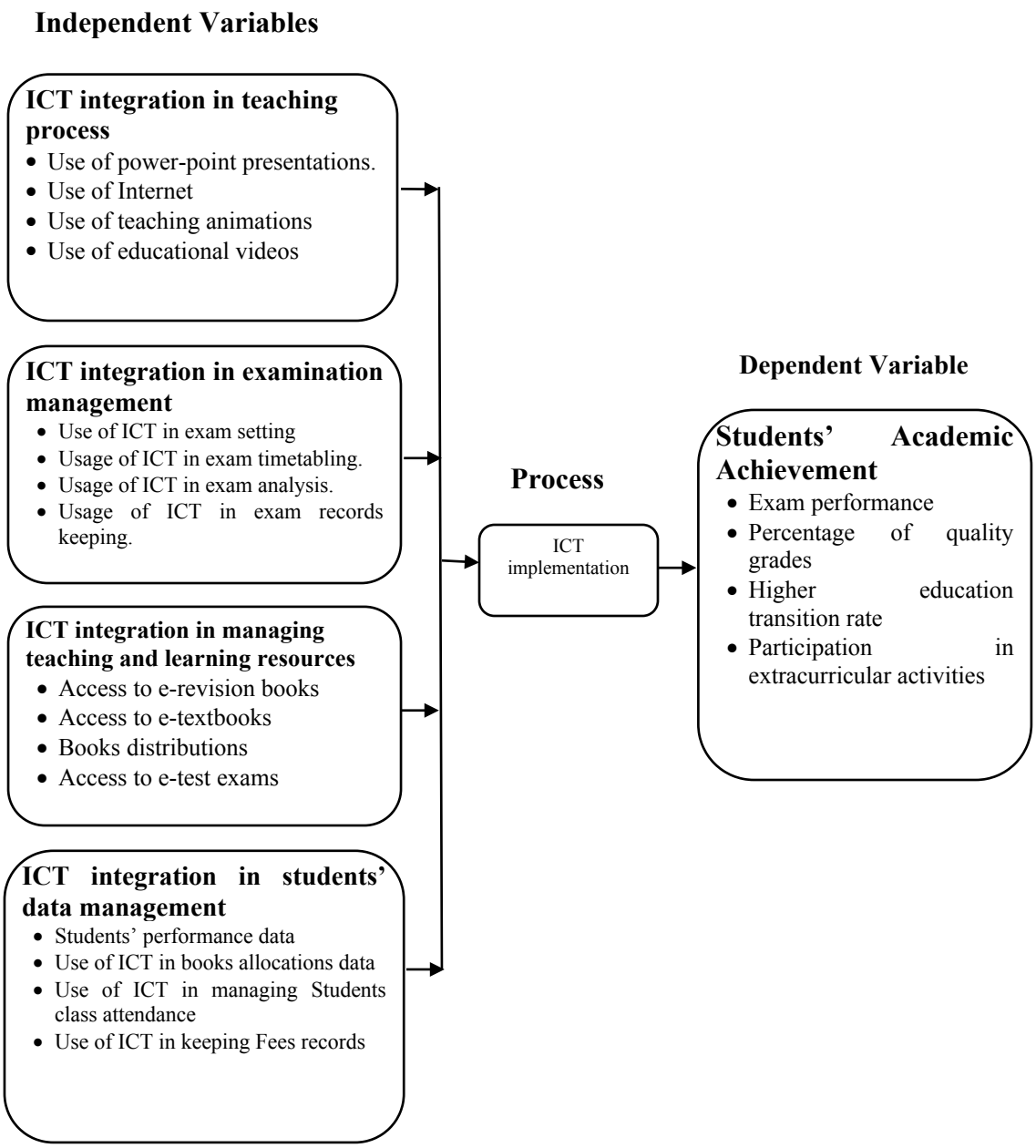

Figure 2. 1: Effect of ICT Integration on Students' Academic Achievement

From the conceptual framework, the ICT integration in various school operations such as teaching process, examination management, managing teaching and learning resources and students' data management are expected to have a linear association with students' academic achievement in every secondary school.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter highlights the research design, targeted population, procedures of sampling and sample size, research tools, data analysis and procedures for collecting data and logistical and research ethics.

3.2 Research Design

Research design is an outline that offers the basis for the integration of every component of a quantitative study so as to ensure that the findings are generalizable, credible and bias-free (Abbott & McKinney, 2013). The research employedcausal research designto assess how ICT integration influenced students' academic achievement. The causal research design was selected with the goal of making the study results applicable to the entire population through generalization. This design is considered suitable for the study since it involves the manipulation of an independent variable to observe its influence on a dependent variable.

3.3 Target Population

Targeted population is a group of individuals or organizations with certain similar traits to be studied by the researcher for generalization of findings regarding the targeted population. The study targeted 13 public secondary schools in Kamukunji sub-county. Therefore, the targeted population was 1871 form four students, 408 secondary school teachers, 13 principals and one sub county director of education in Kamukunji sub-county (Kamukunji Sub County Education Planning Report, 2022). These were targeted

since they are able to offer data on how ICT integration in school operations influence academic achievement of students in every secondary school.

3.4 Sample Size and Sampling Procedure

As per Schreier (2018), sampling is a careful selection of subgroup from the available population in order to represent the entire population with pertinent features and after choosing some of the population elements, conclusion about the whole population can be made. For students and teachers, the sample size was computed utilizing formula developed by Nassiuma (2000) as illustrated below:

$$\mathbf{n} = \frac{\mathbf{N\,(cv^2)}}{\mathbf{cv^2 + (N-1)\,e^2}}$$

Where:

n= sample size;

N = population;

cv = Coefficient of variation (0.6);

e = tolerance (0.05)

Students sample = (1871*0.6*0.6) / (0.6*0.6 + (1871-1)*0.05*0.05) =134.

Teachers sample = (408*0.6*0.6) / (0.6*0.6 + (408-1)*0.05*0.05) = 107.

The students sample was 134 computed using Nassiuma (2000). The teachers sample was 107 computed using Nassiuma (2000). The study chose purposively every principal and the sub-county education director because the population is small. Further, the study

utilized random sampling to make sure that every person in the whole population have an equal probability of representation. The sample distribution was represented in Table 3.1.

Table 3. 1: Sample Size

	Population	**Sampling method**	**Sample size**
Form four students	1871	Random	134
Teachers	408	Random	107
School Principals	13	Purposive	13
Sub county education director	1	Purposive	1
Total	**2293**		**255**

Source: Kamukunji Sub County Education Planning Report (2022)

3.5 Research Instruments

The study entirely depended on primary data obtained through usage of various research tools to examine the subject under study. Hence, the researchutilised both questionnaires and interview guides for collecting primary data.

The researcher used questionnaires which was the major tool of obtaining data. Pandey and Pandey (2021) describe that questionnaires have the capability of collecting a large amount of data in a sensibly limited time. Questionnaires were utilized in obtaining data from the students and teachers. Questionnaires had five sections: Section A contained questions on background information of the participants like age brackets, working experience, gender and academic qualification, Section B contained questions on ICT integration in teaching process, Section C contained questions on ICT integration in examination management, Section D contained questions on ICT integration in learning resources' management, section E contained questions on ICT integration in students'

data management and section F contains questions on students' academic achievement. The questionnaire had both the closed (five-point Likert scales) and open-ended queries.

Further, the study utilized interview guides for collecting qualitative data from principals and sub county director of education. Interviews had questions on how integrating ICT in school operations influence students' academic achievement in every secondary school.

3.5.3 Validity of Research Instruments

Validity is the measure of how well its findings may be extrapolated to different populations. It refers to how well surveys and other tools capture the variables of interest. (Chetwynd, 2022). This research guaranteed validity by presenting questionnaire to the supervisors from the departments so as to assess the relevance of the contents to be used in the instruments. To test for face validity, researcher reviewed the research instrument and ask whether it appears to measure what it is envisioned to assess. To test for criterion validity, researcher compared the results of their research instrument to those of a validated measure. To test for construct validity, researcher assessed the convergent validity which was assessed utilizing factor analysis.

3.5.4 Reliability of Research Instruments

Reliability refers to the extent that research instruments produce consistent outcomes when tested multiple times. The research instruments underwent pilot testing, which involved administering 26 questionnaires to randomly selected pilot survey respondents from Kamukunji sub-county. These respondents constituted 10 percent of the sample size, making it suitable for pre-testing as per Dikko (2016) recommendations. Questionnaire's reliability was assessed using the internal consistency reliability method which involves computing Cronbach alpha. If the Cronbach's alpha (α) is equal to or

greater than 0.7, then every construct in this study is deemed reliable. According to Chan and Lay (2018), a Cronbach's alpha (α) of 0.7 and above indicates that the instrument is deemed reliable and could be utilized for the study. The results of reliability analysis showed that the research tool was reliable as represents in Table 3.2.

Table 3. 2: Reliability Analysis Results

	Cronbach's alpha
ICT Integration in Teaching Process	0.718
ICT Integration in Examination Management	0.731
ICT Integration in Learning resources' management	0.723
ICT Integration in Students' Data Management	0.704
Students' Academic Achievement	0.786

3.6 Data Collection Procedure

The researcher first got a research permit from NACOSTI and letter of authorization from UON. The researcher then pursued approval from Nairobi County education director before proceeding to schools for collection of data. The questionnaires were then distributed to teaching staff and learners in secondary schools. After administration, the researcher gave the respondents adequate time (at least 2 days) to comprehensively fill in questionnaires. On interviews, the researcher booked appointments with the principals and sub-county education director and recorded the answers during the interviews.

3.7 Data Analysis Techniques

Analysis of qualitative data from open-ended queries in questionnaires and interviews was done using content analysis. Specific themes arising from interviews were identified and findings presented in narrative form and direct quotes. On quantitative data, the filled questionnaires were sorted for completeness and those found not completely filled was considered. The data was then coded and data entry done in SPSS. The descriptive statistic like frequency, percentage, means and standard deviations was computed and interpreted. Multiple regression analysis was done for establishing how independent variables predicts the dependent variable. To conduct multiple regression analysis, the variables to regressedwere computed in SPSSby getting the composite mean for each statements describing a certain variable. The computed variables were then regressed against each to obtain output for model summary, ANOVA and regression coefficients. The equation for the model of multiple regression was:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$

Where: -

Y= Students' academic achievement;

β_0=constant; β_1, β_2, β_3 and β_4= coefficientofsregression**;**

X_1= ICT integration in teaching process;

X_2= ICT integration in examination management

X_3= ICT integration in learning resources' management;

X_4= ICT integration in students' data management

ε=Error Term

3.8 Ethical Issues

The researcher assured the participants both orally and in written form that their confidentiality would be maintained throughout the entire research study. The participants were explicitly requested not to include their identities in the questionnaires. The research secured authorization from the county education director and the school principal before commencing the study. The participants were not forced to take part in the study. The researcher informed the participants regarding the academic study goals.

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND INTERPREPATIONS

4.1 Introduction

The study purpose was to assess how integrating ICT in school operations influence students' academic achievement in every secondary school in Kamukunji Constituency, Kenya. Specific objectives intended to examine how students' academic achievement was influenced by integrating ICT in teaching process, management of examinations, managing teaching-learning resources and in students' data management. To achieve this, the data was obtained from students, teachers, principals and sub-county director of education. Hence, the chapter highlights analysis of the collected data. It highlights the response rate, results on participant's background information, findings in relation to study objectives and finally multiple regression analysis.

4.2 Response Rate

The collected data was from students, teachers, principals and sub-county director of education utilizing a questionnaire and interview guides. The findings of the study on rates of response are represented in Table 4.1.

Table 4. 1: Response Rates

	Sample	**Response**	**Response Rates**
Students	134	98	73.1
Teachers	107	83	77.6
Principals	13	8	61.5
Sub-county education director	1	1	100.0
Total	**255**	**190**	**74.5**

As per the outcomes in Table 4.1, the rates of response for the teachers who filled the questionnaires was 77.6%, for students who filled the questionnaires was 73.1% and that of principals who were interviewed was 61.7%. Further, the response for Sub-County director of education was 100% since only 1 Sub-County director of education was targeted. The overall response rate was established at 74.5%. This was significant for conducting an analysis as per Schreier (2018) who argued that response rate that is greater than 50% is significant and adequate for undertaking an analysis in statistics.

4.3 Background Information

The study sought participant's background information which included age brackets, working experience as a teacher, gender and highest academic qualification. The results are illustrated in subsequent sections.

4.3.1 Age Brackets of the Teachers

The researcher required the teaching staff to specify their age brackets. The outcomes are represented in Table 4.2.

Table 4. 2: Age Brackets of Teachers

	Frequency	**Percent**
20-30 yrs.	13	15.7
31-40 yrs.	37	44.6
41-50 yrs.	28	33.7
Above 50 yrs.	5	6
Total	**83**	**100**

From Table 4.2,age for most of the teachers was31-40 years as represented by 44.6%. This implies that every age group was covered in data collection regarding howintegrating ICT influencedstudents' academic achievement. Further, every student targeted was aged between 14 and 18 years.

4.3.2 Working Experience as a Teacher

The researcher required the teaching staff to specify their teaching experiences in years. The outcomes of this finding are represented in Table 4.3.

Table 4. 3: Working Experience as a Teacher

	Frequency	**Percent**
Less than 3 years	7	8.4
3-6 years	24	28.9
7-10 years	46	55.4
Above 10 years	6	7.2
Total	**83**	**100**

According tofindings in Table 4.3, most of the teachers stated that their working experience as a teacher was 7-10 years as represented by 55.4%. This is implication that most of the teachers had satisfactory teaching experiences to be in a position to provide adequate data on how integratingICT in school operations could influence students' academic achievement in public secondary schools in Kamukunji constituency, Kenya.

4.3.3 Gender of the Students and Teachers

The teachers were also needed to specify their gender whether male or female. The outcomes are revealed in Table 4.4.

Table 4. 4: Gender of the Teachers

	Teachers		Students	
	Frequency	**Percent**	**Frequency**	**Percent**
Male	51	61.4	66	67.3
Female	32	38.6	32	32.7
Total	**83**	**100**	**98**	**100**

As per the results in Table 4.4, male teachers were 61.4% while female teachers were 38.6%. In addition, the male students were 67.8% while the female students were 32.7%. This implies that data collection was not biased based on gender as every participant was considered to provide information regarding how ICT integration in school operations could influence in students' academic achievement.

4.3.4 Highest Academic Qualification of the Participants

Further, the teaching staff were required to specify their highest qualification in academics. The results are presented in Table 4.5.

Table 4. 5: Highest Academic Qualifications

	Frequency	**Percent**
Diploma	11	13.3
Degree	59	71.1
Masters	10	12
PhD	3	3.6
Total	**83**	**100**

From Table 4.5, most of the teaching staff stated that their highest qualifications in academics were degree as represented by 71.1%. This implies that the lowest academic qualification for teachers in secondary schools is a diploma. In addition, the results reveal that the teachers were educated adequately to offer credible data regarding how integrating ICT in school operations influenced students' academic achievement.

4.4 ICT Integration in Teaching Process and Students' Academic Achievement

The research intended to determine how integrating ICT in teaching process influence academic achievement of students in every secondary school in Kamukunji Constituency, Kenya.For establishing influence in multiple regression, integrating ICT in teaching process was measured and computed based on Likert scale questions' responses in teacher's questionnaire. The researcher requested every student to specify how ICT is integrated by teachers when teaching in the schools. The outcomes are represented in Table 4.6.

Table 4. 6: How ICT is Integrated by Teachers when Teaching

	Frequency	**Percent**
Power point presentation	55	56.1
Educational videos	43	43.9
Total	**98**	**100**

As per Table 4.6, the students specified that teachers use power point presentation (56.1%) and educational videos (43.9%) when teaching. This implies that in most schools in Kamukunji constituency have integrated ICT in teaching process via usage of power-point presentations and educational videos.

Moreover, the researchers required the teachers to specify their agreement level with every statement describing ICT integration in teaching process in their school using 1-5 Likert scales. The outcomes are represented in Table 4.7.

Table 4. 7: Agreement with Statements on ICT Integration in Teaching Process

	SD (%)	D (%)	N (%)	A (%)	SA (%)	Mean	Std. Dev.
Use of projectors in teaching improve students' academic achievement by enhancing retention of course material through visual aids.	0.0	2.4	14.5	60.2	22.9	4.04	0.69
Use of PowerPoint slides for teaching enhances academic achievement by increasing students-teacher engagement.	0.0	3.6	22.9	68.7	4.8	3.75	0.60
I usually integrate educational videos in teaching process.	8.4	59	24.1	8.4	0.0	2.33	0.75
Integrating educational videos in the teaching process positively affects academic achievement by promoting active learning.	0.0	4.8	12	71.1	12	3.90	0.66
Integrating ICT in teaching saves time that could be used for revision with student to enhance academic achievement.	0.0	4.8	9.6	65.1	20.5	4.01	0.71
The use of teaching animations by teachers in my school leads to enhanced academic achievement.	0.0	31.3	53	15.7	0.0	2.84	0.67
Use internet to source for teaching content while preparing teaching notes leads to enhanced academic achievement.	0.0	2.4	9.6	62.7	25.3	4.11	0.66

As per the outcomes in Table 4.7, regarding the statement that the use internet to source for teaching content while preparing teaching notes leads to enhanced academic achievement, 2.4% of the teachers disagreed, 9.6% were neutral, 62.7% agreed and 25.3% agreedstrongly. The findings implied that when internet is used as a source of teaching, the academic achievement is enhanced.

Further, on the statement that use of projectors in teaching improve students' academic achievement by enhancing retention of course material through visual aids, 2.4% of the teachers disagreed, 14.5% were neutral, 60.2% agreed and 22.9% of the teachers agreedstrongly. The results indicates that use projectors in education enhances students' academic achievement by boosting their ability to retain course content through the use of visual aids.

Moreover, regarding the statement that integrating ICT in teaching saves time that could be used for revision with student to enhance academic achievement,4.8% of the teachers disagreed, 9.6% were neutral, 65.1% agreed and 20.5% of the teaching staff agreed strongly. The findingsimply that integrating ICT in teaching saves time that could be used for revision with student to enhance academic achievement.

Concerning the statement that integrating educational videos in the teaching process positively affects academic achievement by promoting active learning, 4.8% of the teachers disagreed, 12% were neutral, 71.1% agreed while 12% of the participants strongly agreed. The results implies that majority of teachers were of the opinion that integrating educational videos in the teaching process positively influences academic achievement by promoting active learning.

In addition, and that use of PowerPoint slides for teaching enhances academic achievement by increasing students-teacher engagement as represented by 68.7%. However, the teachers were neutral that the use of teaching animations by teachers in their school leads to enhanced academic achievement as represented by 53% and disagreed that they usually integrate educational videos in teaching process as

represented by 59%. The findings imply that use of teaching animations have a minimal impact of academic achievement while most teachers have not integrated educational videos in teaching.

From the interviews, most principals specified that ICT have been integrated in teaching process through PowerPoints presentation, education videos and virtual labs and simulations. In support one of the interviewees said;

> *In my school, we have established computer labs equipped with computers and internet connectivity. These labs are used for various purposes, including interactive e-learning sessions, research, and access to educational resources online. We also ensure that teachers have access to projectors for PowerPoint presentation during the process of teaching* (**Source: Interviewee 1**).

Further the interviewees were asked to specify the ways in which ICT integration in teaching process influences students' academic achievement in their school. The interviewees said that ICT provides access to a huge amount of data through the internet and digital resources, that interactive and multimedia element in ICT tools make learning more engaging and enjoyable for students and that ICT allows for adaptive learning platforms and personalized educational content tailored to individual students' needs and learning styles.

In support, one of the interviewees said;

> *I believe that ICT plays a crucial role in fostering communication and cooperation among students. It enables them to collaborate on projects, exchange ideas, and offer feedback to one another. I also noted that this collaborative approach contributes to the development of critical thinking and problem-solving abilities. Moreover, ICT tools have the capacity to replicate real-world situations and practical applications, enabling students to recognize the tangible significance of*

their learning experiences. This connection to real-life situations enhances students' understanding and motivation to learn (**Source: Interviewee 6**).

Moreover, another interviewee supported by saying;

In my school, integration of ICT has ensured that students have access to a vast amount of information through the internet and digital resources. It has also made learning more engaging and enjoyable for students. Interactive simulations, videos, educational games, and virtual reality can capture students' interest and maintain their focus on the subject matter (**Source: Interviewee 8**).

The results agree with Habibi, Yusop and Razak (2020) who argued that the goal of integrating ICT is to enhance the teaching quality and equipping learners with modern skills. Students who make use of ICT are more likely to advance the competencies essential for competing in the modern worldwide economy. Avbarefe (2021) also argued that ICT is a powerful tool for enhancing teaching and learning and is a catalyst for fundamental reform in current school practices and a veritable vehicle for preparing students for the future. Mbugua, et al. (2015) established that students' academic achievement is positively influenced by ICT integration in teaching since it is a crucial constituent in enhancement of students' academic achievement. The results also agreed with Oichoe (2018) who established that integrating ICT in teaching process have significantly influenced students' academic achievement in every secondary school. Learners had the opportunity to complete assignments independently using online tools, which allowed them to dedicate more time to exam preparation.

4.5 ICT Integration in Examination Management and Academic Achievement

The research further intended to assess how integrating ICT in managing examinations influences students' academic achievement in every secondary school in Kamukunji Constituency. For establishing influence in multiple regression, ICT integration in

examination management was measured and computed based on Likert scale questions' responses in teacher's questionnaire. The teachers were required to specify their agreement level with every statement describing ICT integration in examination management in their school using 1-5 Likert scales. The outcomes are represented in Table 4.8.

Table 4. 8: Agreement with Statements on ICT Integration in Examination Management

	SD (%)	D (%)	N (%)	A (%)	SA (%)	Mean	Std. Dev.
Relying on ICT when setting midterm and end term examinations affects students' academic achievement.	0.0	2.4	6	66.3	25.3	4.14	0.63
Downloading questions for exams from online sites allows teachers to set challenging exams which motivates to make effort to achieve higher grades.	0.0	4.8	25.3	49.4	20.5	3.86	0.80
The integration of ICT in timetabling of exams saves time which can be used to revise for exams.	0.0	3.6	12	63.9	20.5	4.01	0.69
The analysis of examination using ICT tools like computer allows teachers to identify areas for students' academic improvement.	7.2	60.2	27.7	4.8	0.0	2.30	0.68
Having online examination portal for keeping exam records improve academic achievement by letting learners monitor their progress and make informed decisions about their learning.	0.0	4.8	13.3	57.8	24.1	4.01	0.76
Integrating ICT in exam management facilitate teachers in assessing learning outcomes.	3.6	26.5	55.4	14.5	0.0	2.81	0.72

From Table 4.8, on statement that relying on ICT when setting midterm and end term examinations influence students' academic achievement, 2.4% of the teachers disagreed, 6% were neutral, 66.3% agreed while 25.3% of the teaching staff agreed strongly. The statement had an average of 4.14 which shows that most of the teaching staff were in agreement that relying on ICT when setting midterm and end term examinations influence students' academic achievement.

Further, on statement that the integration of ICT in timetabling of exams saves time which can be used to revise for exams, 3.6% disagreed of the teachers, 12% were neutral, 63.9% agreed while 20.5% of the teachers strongly agreed. The statement had an average of 4.01 which implies that most of the teaching staff agreed that integrating ICT in timetabling of exams saves time which can be used to revise for exams.

Moreover, concerning the statement that having online examination portal for keeping exam records improve academic achievement by lettinglearners to track their progress and make informed decisions about their learning,4.8% of the teachers disagreed, 13.3% were neutral, 57.8% agreed while 24.1% of the teachers agreed. The statement had an average of 4.01 which implies that most of the teachers were in agreement that having online examination portal for keeping exam records improve academic achievement by lettinglearners monitor their progress and make informed decisions about their learning.

Moreover, regarding the statement that downloading questions for exams from online sites allows teachers to set challenging exams which motivates to make effort to achieve higher grades, 4.8% of the teachers disagreed, 25.3% were neutral, 49.4% agreed while 20.5% of the teachers strongly agreed. The statement had a mean of 3.86 which shows

that downloading questions for exams from online sites allows teachers to set challenging exams which motivates to make effort to achieve higher grades.

However, the teachers were neutral that integrating ICT in exam management facilitates teachers in assessing learning outcomes as represented by 55.4%. Additionally, the teachers were in disagreement that the analysis of examination using ICT tools like computer allows teachers to identify areas for students' academic improvement as represented by 60.2%. The findings imply that integrating ICT in exam management have minimal impact in assessing learning outcomes.

From the interviews, the interviewees were asked to specify how they have integrated ICT in managing exams process in their school. The interviewees said that ICT has been integrated in managing exam through exam scheduling, analysis and analysis. In support, one of the interviewees said;

> *In my school, we have slowly transitioned from traditional paper-based examinations to e-exams. These e-exams are usually conducted on computers, allowing for automated grading and instant result generation. My school also have an exam software system for inputting and calculating results which reduces the time and effort required for manual grading* (**Source: Interviewee 5**).

Further, the interviewees were required to specify ways in which ICT integration in managing examinations influences students' academic achievement in their school. The interviewees said that examination management systems integrated with ICT can generate valuable data on student performance which could be utilised by teachers and administrators to make informed decisions, such as implementing targeted interventions

for struggling students or adjusting teaching methods to enhance overall academic achievement. In addition, the interviewees said that online assessment tools can provide instant feedback to students after they complete exams which could help students identify their mistakes and misconceptions, enabling them to rectify errors and enhance their understanding to enhance student's academic achievement. In support of the above arguments, one of the interviewees said;

> *Integrating ICT in managing examinations in our school has made it possible to generate valuable data on student performance which plays a key role in identifying areas of improvement to enhance students' academic achievement. In addition, ICT integration in examination management can streamline administrative processes, reducing the chances of errors and delays in exam scheduling, grading, and result publication* (**Source: Interviewee 3**).

The findings agree with Blau and Shamir-Inbal (2017) who argued that ICT is an efficient tool for integrating and automating various activities of examination system as it saves time that teachers can use in focusing on revision with students. Having easy accessibility to ICT facilities, like the Excel software program, guarantees precision, timeliness, and efficiency in managing the entire examination process, as it permits the smooth flow of data and the implementation of suitable risk surveillance systems.

The findings also correlate with Ahuja (2016), the software that was designed for the purpose of exam management in schools is intended for use by school officials, and it can play the function of an assessment for principals, teachers, and learners. The ICT usage, particularly the spreadsheet application Excel, made it possible for administrators and teachers to more easily handle data and keep accurate records, which in turn improves the

management of schools and individual classrooms. Oyier, Odundo, Lilian and Wangui (2015) established that use of electronic media for keeping tabs on class attendance and upkeep is made possible by the automation of timetabling whereas in management of exams, it allows for analysis of results analysis and producing reports for board of management, guardians, school departments, class teachers and students.

4.6 ICT Integration in Learning resources' management and Academic Achievement

The study also intended to determine how ICT integration in managing teaching and learning resources influenced academic achievement of students in every secondary school in Kamukunji Constituency. For establishing influence in multiple regression, ICT integration in learning resources' management was measured and computed based on Likert scale questions' responses in teacher's questionnaire. Further, the students are requested to specify the areas where ICT has been applied in their school. The outcomes are represented in Table 4.9.

Table 4. 9: Areas where ICT has been Applied

	Frequency	**Percent**
Access to e-revision books	51	52
Access to e-textbooks	11	11.2
Books distributions	8	8.2
Access to e-test exams	28	28.6
Total	**98**	**100**

As per the outcomes in Table 4.9, the students designated that ICT has been applied in ensuring access to e-revision books as represented by 52%, ensuring access to e-test exams as represented by 28.6%, ensuring access to e-textbooks as represented by 11.2% and ensuring books distributions as represented by 8.2%. This shows that ICT has been used in many secondary schools in Kamukunji constituency in ensuring access to e-revision books, to e-test exams and to e-textbooks.

Moreover, the teachers were requested to specify their agreement level with statements describing ICT integration in learning resources' management in their schools utilizing 1-5 Likert scales. The outcomes are represented in Table 4.10.

Table 4. 10: Agreement with Statements on ICT Integration in Learning Resources' Management

	SD (%)	D (%)	N (%)	A (%)	SA (%)	Mean	Std. Dev.
The integration of ICT in our school ensures there are electronic revision books available for every student to improve their academic achievement	2.4	1.2	9.6	55.4	31.3	4.12	0.82
Teachers are able to access to electronic textbooks when ICT is integrated to improve students' academic achievement	0.0	2.4	12	65.1	20.5	4.04	0.65
Teachers are able to access to electronic workbooks when ICT is integrated to improve students' academic achievement	3.6	21.7	49.4	25.3	0.0	2.96	0.79
Both students and teachers can access test exams online in our school to improve students' academic achievement	7.2	47	37.3	8.4	0.0	2.47	0.75
Students can access interpretation	0.0	6	18.1	57.8	18.1	3.88	0.77

of certain concepts online which gives students avenues to improve academic achievement

From outcomes in Table 4.10, regarding the statement that the integration of ICT in their school ensure there are electronic revision books available for every student to improve their academic achievement, 2.4% of the teachers strongly disagreed, 1.2% disagreed, 9.6% were neutral, 55.4% agreed while 31.3% of the teaching staff agreed strongly. The statement had an average of 4.12 which implies that integration of ICT in their school ensures there are electronic revision books available for every student to improve their academic achievement.

Further regarding the statement that teachers are capable to access to electronic textbooks when ICT is integrated to improve students' academic achievement,2.4% of the teachers disagreed, 12% were neutral, 65.1% agreed while 20.5% of the teachers strongly agreed. The statement had an average of 4.04 which implies that teachers are capable to access to electronic textbooks when ICT is integrated to improve students' academic achievement.

Further, the teachers were in agreement that students could access interpretation of certain concepts online which gives students avenues to improve academic achievement, 6% of the teachers disagreed, 18.1% were neutral, 57.8% agreed while 18.1% of the teachers strongly agreed. The statement had an average of 3.88 which implies that students could access interpretation of certain concepts online which gives students avenues to improve academic achievement.

However, the teachers were neutral that they are capable of accessing electronic workbooks when ICT is integrated to improve students' academic achievement as represented by 49.4% and disagreed that both students and teachers can access test exams online in their school to improve students' academic achievement as represented by 47%. These findings imply that some teachers are incapable of accessing electronic workbooks when ICT is integrated to improve students' academic achievement and it is not possible for both students and teachers to access test exams online.

The interviewees specified that they have integrated ICT in learning resources' management in their school. The interviewees specified that ICT is being integrated in ensuring access to e-revision books, e-textbooks and e-test exams. Further, the interviewees were required to specify ways in which ICT integration in learning resources' management influence students' academic achievement in their school. The interviewees said that integration of ICT ensures there are electronic revision books available for every student to improve their academic achievement. The interviewees also said that ICT integration offers students accessing a lot of digital learning resources including online books, interactive simulations, and online databases which provide students with diverse and up-to-date information, catering to different learning styles and abilities, ultimately fostering a deeper understanding of the subjects. In support, one of the interviewees said;

> *In my school, integrating ICT in learning resource management have ensured that teachers have easy access to teaching resources including e-books and e-exams. ICTintegration have also allowed the students to access a wide range of digital*

learning resources which offer students with diverse and up-to-date information, catering to different learning styles and abilities, ultimately fostering a deeper understanding of the subjects (**Source: Interviewee 6**).

The findings agree with Arthur-Nyarko, et al., (2020) who argued that among the key merits of integrating ICT in managing teaching and learning resources is the ability to create and distribute materials quickly and easily. With digital tools like learning management systems (LMS), teachers can easily upload and share materials with students, without the need for printing and distributing physical copies. The result also correlates with Alenezi (2020) who asserted that ICT has transformed the way teaching and learning resources are managed which has made it easier to create, store, access, and share educational resources. With ICT, teachers can create digital content such as presentations, videos, e-books, and podcasts. These resources can be easily edited, updated, and shared with students and other teachers. The results agree with Alenezi (2020) who argued that the integrating ICT in learning resources' management have played a crucial role in improving teaching and students' performance. This might be linked to the fact that the integration of ICT allows for easy and immediate access to a wealth of learning resources such as electronic books, online journals, and interactive multimedia materials, which could aid students in their studies.

4.7 ICT Integration in Students' Data Management and Academic Achievement

The study intended to assess how integrating ICT in students' data management influences students' academic achievement in secondary schools in Kamukunji Constituency. For establishing influence in multiple regression, ICT Integration in

students' data managementwas measured and computed based on Likert scale questions' responses in teacher's questionnaire. The students were asked to specify how ICT is used in their school for students' data management activities. The outcomes are revealed in Table 4.11.

Table 4. 11: How ICT is used for Students' Data Management Activities

	Frequency	**Percent**
Students' performance data	42	42.9
Books allocations data	20	20.4
Managing Students class attendance	19	19.4
Keeping Fees records	17	17.3
Total	**98**	**100**

From outcomes in Table 4.11, the students stated that in their school, ICT is used in managing students' performance data as represented by 42.9%, managing books allocations data as represented by 20.4%, managing Students class attendance as represented by 19.4% and keeping Fees records as represented by 17.3%. This implies that in many secondary schools in Kamukunji constituency ICT is used in managing students' performance data, books allocations data, managing students class attendance and keeping fees records.

Additionally, the teachers were requested to specify their agreement level with every statement describing ICT integration in students' data management in the schools. The outcomes are represented in Table 4.12.

Table 4. 12: Agreement with Statements on ICT Integration in Students' Data Management

	SD (%)	D (%)	N (%)	A (%)	SA (%)	Mean	Std. Dev.
The data of performance is monitored effectively through use of ICT tools which identifies areas to focus so as to improve academic achievement	0.0	4.8	16.9	61.4	16.9	3.90	0.73
Integration of ICT have allowed teachers to effectively keep clear books allocations data	0.0	7.2	16.9	67.5	8.4	3.77	0.70
Teachers monitor class attendance of students through use of ICT tools which ensure students are present in every in an effort to improve academic achievement	7.2	60.2	30.1	2.4	0.0	2.28	0.63
Integration of ICT have made possible to keep students fee records which affects academic achievement as students can learn without interruptions	0.0	1.2	10.8	62.7	25.3	4.12	0.63
Integration of ICT have made possible to store the performance history data of students which affects academic achievement since students' progress can be tracked	0.0	1.2	9.6	67.5	21.7	4.10	0.60

As per Table 4.12, concerning statement that integration of ICT has made possible to keep students fee records which influences academic achievement as students can learn without interruptions, 1.2% of the teachers disagreed, 10.8% were neutral, 62.7% agreed while 25.3% of the teaching staff agreed strongly. The statement had a mean of 4.12 which implies that integration of ICT has made possible to keep students fee records which influences academic achievement as students can learn without interruptions.

Further on statement that integration of ICT has made possible to store the performance history data of students which influences academic achievement since students' progress can be tracked, 1.2% of the teachers disagreed, 9.6% were neutral, 67.5% agreed while 21.7% of the teachers agreedstrongly. The statement had an average of 4.10 which implies that integration of ICT has made possible to store the performance history data of students which influences academic achievement since students' progress can be tracked.

Moreover, regarding the statement that the data of performance is monitored effectively through use of ICT tools which identifies areas to focus so as to improve academic achievement, 4.8% disagreed, 16.9% were neutral, 61.4% agreed while 16.9% of the teachers agreedstrongly. The statement had an average of 3.90 which implies that data of performance is monitored effectively through use of ICT tools which identifies areas to focus so as to improve academic achievement.

The teachers were further in agreement that integration of ICT have allowed teachers to effectively keep clear books allocations data as represented by 67.5%. However, the teachers disagreed that they monitor class attendance of students through use of ICT tools which ensure students are present in every in an effort to improve academic achievement

as represented by 60.2%. These findings imply that ICT has been integrated to effectively keep clear books allocations data but most schools have not been able to use ICT tools in monitoring class attendance of students.

The interviewees were requested to specify ways in which they think integrating ICT in students' data management influenced students' academic achievement in their schools. The interviewees said that school administrators and teachers can use ICT data analytics to identify trends and patterns in student performance and this data-driven approach helps them make informed decisions on curriculum adjustments, teaching methodologies, and interventions to support struggling students. The interviewees also said that ICT integration in students' data management empowers educators, students, and parents with valuable information and tools to support and enhance academic achievement.

In support, one the interviewees said;

> *ICT allows for the creation of centralized databases and digital platforms where student data, including grades, attendance records, and progress reports, can be easily accessed by teachers, students, and parents. When students and parents have access to real-time academic information, they can monitor their performance, identify areas for improvement, and take timely corrective actions. I also think ICT provide immediate feedback to students on their performance. This prompt feedback helps students understand their mistakes and areas of improvement, allowing them to make necessary adjustments and progress more effectively* (**Source: Interviewee 4**).

The results agree with Rosman and Buřita (2014) who noted that schools can improve their existing minimal levels of use by implementing ICT-founded student assessment tracking system and by developing internal reporting softwares. The use of ICT helps

students form a positive, personal connection to the process of self-evaluation. Rosman and Buřita (2014) noted that Student Information Systems (SIS) allow schools to manage student information, such as attendance records, grades, and schedules. SIS software can be used to automate administrative tasks and provide real-time access to student data. Student Portals allow students to access their own academic records, such as grades, attendance, and schedules.

The findings corelate with Oboegbulem and Ugwu (2013) who noted that ICT Integration in students' data management helps in tracking a student progress becomes easier because some systems are designed to alert the institute when a student misses three or more periods in a row. Mensah (2016) established that ICT has been recognized by administrators at the University of Cape Coast as an essential and effective medium for improving the management of day-to-day operations.

4.8 Students' Academic Achievement

For establishing influence in multiple regression, students' academic achievementwas measured and computed based on Likert scale questions' responses in teacher's questionnaire. The teachers were requested to record data for various aspects of students' academic achievement. The outcomes are represented in Table 4.13.

Table 4. 13: Trend of Aspects of Students' Academic Achievement

	Average
Percentage of quality grades	38%
University transition rate	33%
Annual Mean grades	5.412

Graduation rate	63%

As per the results in Table 4.13, among the secondary schools in Kamukunji constituency, the average percentage of quality grades was 38%, average university transition rate was 33%, average annual mean grade was 6.412 and the average graduation rate was 63%.

The teachers were required to indicate their agreements levels with every statement describing students' academic achievement using 1-5 Likert scales. The outcomes were revealed in Table 4.14.

Table 4. 14: Agreement with Statements on Students' Academic Achievement

	SD (%)	D (%)	N (%)	A (%)	SA (%)	Mean	Std. Dev.
Performance of students have improved over the last 5 years	2.4	7.2	18.1	57.8	14.5	3.75	0.88
There has been an increase in university transition rate	0.0	7.2	72.3	20.5	0.0	3.13	0.51
Most students have actively participated in extracurricular activities	0.0	1.2	8.4	68.7	21.7	4.11	0.58
The Percentage of quality grades have increased over the last 5 years.	10.8	57.8	24.1	7.2	0.0	2.28	0.75

From outcomesin Table 4.14, the teachers agreed that most students have actively participated in extracurricular activities as represented by 68.7% and that performance of students have improved over the last 5 years as represented by 57.8%. However, the teachers were neutral that there has been an increase in university transition rate as represented by 72.3% and disagreed that the percentage of quality grades has increased over the last 5 years as represented by 57.8%. The findings agree with Basri,

Alandejaniand Almadani (2018) who argued that standardized achievement tests scores, teacher judgments of academic achievement, and grades on report cards are some of the ways that academic achievement of children can be evaluated. Standardized achievement exams are objective devices that evaluate students' progress in school by measuring their mastery of predetermined content areas like reading and writing. Bai, Mo, Zhang, Boswell and Rozelle (2016) established that integrating ICT in teaching program, examination management and provision of electronic materials positively and significantly impacts on academic achievement of student in Rural Schools in China. Habibi, et al. (2020) argues that ICT enhances how lesson materials are presented through PowerPoint presentations, enhances comprehension during presentation of lessons, makes teaching livelier for learners and positively changes the association between the learners and teachers in secondary schools. This implies that ICT integration in teaching process significantly influenced performance academically of learners in Indonesia. Saxena (2017) argued that integrating ICT in Canadian secondary schools has streamlined teaching process and this in turn have been improving students' academic achievement by 60 percent. Albert and Dahling (2016) noted that one of the initiatives that policy makers have considered to improve education is ICT integration. Integrating ICT in every secondary school is the integrating of information and communication technologies into the teaching and learning process to enhance student engagement, promote active learning, and improve educational outcomes.Habibi, *et al*. (2020) argues that ICT enhances how lesson materials are presented through PowerPoint presentations, enhances comprehension during presentation of lessons, makes teaching livelier for learners and positively changes the association between the learners and teachers in

secondary schools. This implies that ICT integration in teaching process had a significant influence on academic achievement of learners in Indonesia.

4.9 Multiple Regression Analysis

Multiple regression analysis was done for establishing howintegrating ICT in school operations predicts the students' academic achievement in secondary schools in Kamukunji Constituency. To conduct multiple regression analysis, the variables (ICT Integration in Teaching Process, ICT Integration in Examination Management, ICT Integration in Learning resources' management, ICT Integration in Students' Data Managementand students' academic achievement) regressed were computed in SPSS by getting the composite mean for each Likert scale statement describing a certain variable in teachers' questionnaire. The computed variables were then regressed against each to obtain output for model summary, ANOVA and regression coefficients. The outcomes are presented in Table 4.15, 4.16 and 4.17.

Table 4. 15: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error
1	.853[a]	.727	.713	.188

a. Predictors: (Constant), ICT Integration in Students' Data Management, Examination Management, Learning resources' management, Teaching Process

As per the results, the R-square was 0.727 which shows that 72.7% of the changes in students' academic achievement in secondary schools in Kamukunji Constituency could be linked to ICT Integration in various school operations like teaching process, students' data management, examination management and learning resources' management.

Table 4. 16: ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7.369	4	1.842	51.940	.000[b]
	Residual	2.767	78	.035		
	Total	**10.136**	**82**			

a. DependentVariable: Students'Academic Achievement

b. Predictors:(Constant), ICT Integration in Students' Data Management, Examination Management, Learning resources' management, Teaching Process

As per the findings in Table 4.16, the F-computed was 51.94 while p-value was 0.000. Since F-computed exceeded the F-critical (2.4889) while p-value did not exceed 0.05. This is an implication that the regression model was significant and hence ICT integration in school operations could be used to predict students' academic achievement in secondary schools in Kamukunji Constituency.

Table 4. 17: Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	**Std. Error**	**Beta**	**t**	**Sig.**
1	(Constant)	1.062	.106		10.019	.000
	ICT Integration in Teaching Process	.742	.111	.782	6.685	.000
	ICT Integration in Examination Management	.618	.266	.747	2.323	.023
	ICT Integration in Learning resources' management	.824	.271	.855	3.041	.003
	ICT Integration in Students' Data Management	.769	.064	.799	12.016	.000

a. Dependent Variable: Students' Academic Achievement

As per the results, the equation generated was:

$$\mathbf{Y} = 1.062 + 0.742\mathbf{X}_1 + 0.618\mathbf{X}_2 + 0.824\mathbf{X}_3 + 0.769\mathbf{X}_4$$

Where:

Y = Students' academic achievement

$\mathbf{X}_1$ = ICT Integration in Teaching Process

$\mathbf{X}_2$ = ICT Integration in Examination Management

$\mathbf{X}_3$ = ICT Integration in Learning resources' management

$\mathbf{X}_4$ = ICT Integration in Students' Data Management

The results revealed that integrating ICT in teaching process significantly influenced students' academic achievement in secondary schools in Kamukunji Constituency (B=0.742; p=0.000). Further, the results revealed that integrating ICT in managing examinations significantly influenced students' academic achievement in every secondary school in Kamukunji Constituency (B=0.618; p=0.023). The results also showed that ICT integration in learning resources' management significantly influenced students' academic achievement in secondary schools in Kamukunji Constituency (B=0.824; p=0.003). Lastly, the results established that ICT integration in students' data management significantly influenced students' academic achievement in secondary schools in Kamukunji Constituency (B=0.769; p=0.000). Mbugua, et al. (2015) established that integration of ICT in teaching plays a crucial role in enhancing students' academic achievement, as it positively impacts their learning outcomes. Alenezi (2020) argued that the ICT integration in learning resources' management have played a key role in enhancing teaching as well as performance of students. This could be linked to the fact that the integration of ICT allows for easy and immediate access to a wealth of learning resources like electronic books, online journals, and interactive multimedia materials,

which could aid students in their studies. Oboegbulem and Ugwu (2013) noted that ICT Integration in students' data management helps in tracking a student progress becomes easier because some systems are designed to alert the institute when a student misses three or more periods in a row.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The study's goal was to assess how ICT integration in school operations influenced students' academic achievement in secondary schools in Kamukunji Constituency, Kenya. This chapter highlights the summary, conclusion and recommendation of the study deduced from the results founded on study objectives.

5.2 Summary of the Study

The main objective of the study was to assess how ICT integration in school operations influenced students' academic achievement in secondary schools in Kamukunji Constituency, Kenya. Specifically, the study sought to assess how integrating ICT in teaching process influences students' academic achievement, to determine how integrating ICT in examination management influences students' academic achievement, to determine how ICT integration in managing teaching and learning resources affects academic achievement of students and to assess the effect of ICT integration in students' data management on academic achievement of students in every secondary school in Kamukunji Constituency. The research was based on technology acceptance theory (TAT). The research employed survey research design. The research targeted 1871 form four students, 408 secondary school teachers, 13 principals and 1 sub county education director in Kamukunji sub-county. The study utilized both questionnaires and interview guides for collecting primary data. Data was analyzed utilizing descriptive and inferential statistic.

5.2.1 ICT Integration in Teaching Process and Students' Academic Achievement

The research intended to determine how integratimg ICT in teaching process affects students' academic achievement in every secondary school in Kamukunji Constituency, Kenya. The study revealed that integrating ICT in teaching process significantly influenced students' academic achievement in secondary schools in Kamukunji Constituency (B=0.742; p=0.000). The research found that in majority of schools in Kamukunji constituency have integrated ICT in teaching process through the usage of PowerPoint presentations and educational videos among others. The study found that use internet to source for teaching content while preparing teaching notes leads to enhanced academic accomplishment and that use of projectors in teaching improve students' academic achievement by enhancing retention of course material through visual aids. Further, the study as well established that integrating ICT in teaching saves time that could be used for revision with student to enhance academic achievement and that integrating educational videos in the teaching process positively affects academic achievement by promoting active learning. The study revealed that use of PowerPoint slides for teaching enhances academic achievement by increasing students-teacher engagement. The study established that usage of teaching animations by teachers in schools leads to enhanced academic achievement and that they do not usually integrate educational videos in teaching process. The study established that ICT provides accessibility to huge amount of information through the internet and digital resources, that interactive and multimedia element in ICT tools make learning more engaging and enjoyable for students and that ICT enables the development of adaptive learning

platforms and customized educational materials designed to cater to the unique needs and preferred learning methods of each student.

5.2.2 ICT Integration in Examination Management and Academic Achievement

The research further intended to evaluate how integrating ICT in management of examinations influences students' academic achievement in secondary schools in Kamukunji Constituency. The study revealed that integrating ICT in managing examinations significantly influenced academic achievement of students in every secondary school in Kamukunji Constituency (B=0.618; p=0.023). It was revealed that in majority of every secondary school in Kamukunji constituency, ICT has been integrated in exam management by using ICT tools in exam setting, timetabling and analysis. The study found that relying on ICT when setting midterm and end term examinations affects students' academic achievement and that the integration of ICT in timetabling of exams saves time which can be used to revise for exams. Further, the study found that having online examination portal for keeping exam records improve academic achievement by letting learners monitor their progress and make informed decisions about their learning. Moreover, the study established that downloading questions for exams from online sites allows teachers to set challenging exams which motivates to make effort to achieve higher grades and that integrating ICT in exam management facilitate teachers in assessing learning outcomes. The study found that the analysis of examination using ICT tools like computer allows teachers to identify areas for students' academic improvement. The study found that examination management systems integrated with ICT can generate valuable data on student performance which isutilized by teachers and administrators to

make informed decisions, such as implementing targeted interventions for struggling students or adjusting teaching methods to enhance overall academic achievement.

5.2.3 ICT Integration in Learning resources' management and Academic Achievement

The research also intended to determine how integrating ICT in managing teaching and learning resources affects academic achievement of students in secondary schools in Kamukunji Constituency. The study found that integrating ICT in learning resources' management significantly influenced students' academic achievement in every secondary school in Kamukunji Constituency (B=0.824; p=0.003). The research as well revealed that ICT has been used in many secondary schools in Kamukunji constituency in ensuring access to e-revision books, to e-test exams and to e-textbooks. The study established that the integrating ICT in schools ensures there are electronic revision books available for every student to enhance their academic achievement and that teachers are able to access to electronic textbooks when ICT is integrated to improve students' academic achievement. Moreover, the study found that students can access interpretation of certain concepts online which gives students avenues to improve academic achievement and that teachers are able to access to electronic workbooks when ICT is integrated to improve students' academic achievement. The study as well established that both learners and teaching staff cannot access test exams online in schools to enhance students' academic achievement. Further, the study found that integration of ICT ensures there are electronic revision books available for every student to enhance academic achievements. The research established that ICT integration allows students in accessing a lot of digital learning resources including online books, interactive simulations,

educational websites, and online databases which provide students with diverse and up-to-date information, catering to different learning styles and abilities, ultimately fostering a deeper understanding of the subjects.

5.2.4 ICT Integration in Students' Data Management and Academic Achievement

The study intended to examine the effect of ICT integration in students' data management on academic achievement of students in every secondary school in Kamukunji Constituency. The study established that integrating ICT in students' data management significantly influenced students' academic achievement in every secondary school in Kamukunji Constituency (B=0.769; p=0.000). The research revealed that in many secondary schools in Kamukunji constituency ICT is used in managing students' performance data, books allocations data, managing students class attendance and keeping fees records. The study also found that integration of ICT has made possible to keep students fee records which affects academic achievement as students can learn without interruptions and that integration of ICT have made possible to store the performance history data of students which affects academic achievement since students' progress can be tracked. The study established that the data of performance is monitored effectively through use of ICT tools which identifies areas to focus so as to improve academic achievement and that integration of ICT have allowed teachers to effectively keep clear books allocations data. The study established that school administrators and teachers can usage of ICT data analytics to identify trends and patterns in student performance and this data-driven approach helps them make informed decisions on curriculum adjustments, teaching methodologies, and interventions to support struggling students. It was also established that ICT integration in students' data management

empowers educators, students, and parents with valuable information and tools to support and enhance academic achievement.

5.3 Conclusions

The study concluded that integrating ICT in teaching process significantly influenced students' academic achievement in every secondary school in Kamukunji Constituency. This could be linked to the fact that ICT integration have ensured teachers can source teaching content online which saves time that can be used for revisions and early syllabus coverage. ICT can be integrated through use of projectors which utilizes visual aid in teaching improve students' academic achievement as it enhances retention of course material. Integrating ICT in teaching promotes active learning, increase students-teacher engagement and also saves time that could be used for revision with student to enhance academic achievement.

The study further concluded that integrating ICT in managing examinations significantly influenced students' academic achievement in secondary schools in Kamukunji Constituency. Integration of ICT in timetabling of exams saves time which can be used to revise for exams. Further, having online examination portal for keeping exam records improve academic achievement by allowing students to track their progress and make informed decisions about their learning. Analysis of examination using ICT tools like computer allows teachers to identify areas of weakness for students and hence implement targeted interventions for struggling students to enhance overall academic achievement.

The study also concluded that integrating ICT in learning resources' management significantly influenced students' academic achievement in every secondary school in

Kamukunji Constituency. Integration of ICT in schools ensures there are electronic revision books available for every student to improve their academic achievement and electronic textbooks accessible for teachers. ICT integration enables students to utilize diverse digital learning materials, including electronic books, interactive simulations, educational websites, and online databases which provide students with diverse and up-to-date information, catering to different learning styles and abilities, ultimately fostering a deeper comprehension of the subjects

The study concluded that integration ICT in students' data management significantly influenced students' academic achievement in every secondary school in Kamukunji Constituency. Integration of ICT has made possible to keep students fee records which affects academic achievement as students can learn without interruptions. Moreover, integration of ICT has made possible to store the performance history data of students which affects academic achievement since students' progress can be tracked. School administrators and teachers can use ICT data analytics to identify trends and patterns in student performance and this data-driven approach helps them make informed decisions on curriculum adjustments, and interventions to support struggling students.

5.4 Recommendations of the Study

The following recommendations were made:

i. The study recommends that ministry of education in collaboration with teacher's service commission should implement regular and comprehensive professional development programs to train teachers in effective ICT integration techniques in the classroom. This would equip teachers with requisite skills to efficiently

integrate ICT in the process of teaching in an effort to enhance students' academic achievement.

ii. The study as well recommends that the ministry of education need to revise the curriculum to incorporate ICT as a crucial constituent of the teaching and learning process. This should include subject-specific guidelines on how ICT can be effectively utilized to enhance academic achievement. The Ministry should provide a repository of approved digital content that aligns with the curriculum, making it easily accessible to teachers.

iii. The study as well recommends that school principals need to seek funding from the ministry of education for development and improvement of ICT infrastructure in secondary schools in Kamukunji Constituency. This includes provision of reliable internet connectivity, ensuring sufficient computer labs, and maintaining up-to-date hardware and software for managing examinations in the schools.

iv. There is need for school administrators to be encouraged to ensure ICT is integrated in exam analysis. This would effectively allow teachers to identify areas of weakness for students and implement targeted interventions for struggling students or adjust teaching methods to enhance overall academic achievement.

v. There is also need for the ministry of education to collaborate with local authorities and stakeholders to identify schools in need of infrastructure upgrades and allocate resources accordingly. Regular maintenance and technical support should be provided to ensure smooth functioning of ICT facilities.

vi. The study further recommends that school management should implement a system that ensures that both students and teachers can access test exams online. This will make it easy for teachers to effectively assess the students and initiate strategies for improving the academic achievement of students.

vii. The study as well recommends that secondary schools' management should organize regular training sessions for teachers and examination staff to enhance their ICT skills and proficiency in using examination management software and tools. There is also a need to develop standardized protocols and guidelines for the secure management of examinations using ICT to prevent issues like cheating, data breaches, and technical glitches.

viii. The study further recommends that principals in secondary schools needs to implement robust and user-friendly data management systems that allow easy input, storage, retrieval, and analysis of student data. These systems should be secure and comply with data protection regulations. This would ensure that students data like performance records and fee records are easily accessible by teachers for effective decision making that might affects academic achievement of students.

ix. The study recommends that secondary school administrators should procure a software for monitoring the students class attendance. This would ensure that all students are present in every in an effort to improve academic achievement.

x. The study also recommends that ministry of education in collaboration with relevant stakeholders should implement a standardized learning management system (LMS) in all secondary schools to streamline communication, assignment

submission, grading, and tracking of students' progress. The LMS serves as a central platform for teachers, learners and parents, facilitating a more efficient and organized educational experience.

5.5 Suggestions for Further Research

The recommendations for future studies include:

i. Since the study was limited to Kamukunji constituency, similar studies should be done to examine how ICT integration in school operations affects students' academic achievement in secondary schools in other constituencies in Kenya.

ii. A study should be done to identify and establish challenges facing the integration of ICT in secondary schools of Kamukunji constituency.

iii. There is also a need to conduct longitudinal study that follows students' academic progress over an extended period to evaluate the long-term influence of ICT integration on their academic achievement.

iv. Future studies should also examine the role of parental involvement and support in the context of ICT integration and how parents' understanding and encouragement of technology use affect students' academic achievement.

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APPENDICES

Appendix I: Research Questionnaire for Teachers

The goal of this survey is to collect data in regard to the influence of ICT integration in school operations on students' academic achievement in secondary schools. The data gathered through this survey is intended solely for academic purposes, and your personal details will remain anonymous. Hence, we kindly ask you to respond to all the questions by selecting the suitable options**(✓)**.

Section A: Background Information

1) Kindly specify the age bracket you belong to

   20-30 yrs [ ]

   31-40 yrs [ ]

   41-50 yrs [ ]

   Above 50 yrs[ ]

2) Specify your teaching experience in years?

   Less than 3 yrs. [ ]

   3-6 yrs. [ ]

   7-10 yrs. [ ]

   Above 10 yrs. [ ]

3) Gender?

   Male [ ]

   Female [ ]

4) Kindly specify your highest qualifications in academics?

Certificate [ ]

Diploma [ ]

Degree [ ]

Masters [ ]

PhD [ ]

Section B: ICT Integration in Teaching Process

5) Kindly specify agreement level with every statement describing ICT integration in teaching process in your school using 1-5 Likert scales in which 1 is StronglyDisagrees (SD), 2 is Disagrees(D), 3 is Neutral(N), 4 is Agrees(A) and 5 is StronglyAgrees(SA).

	1	**2**	**3**	**4**	**5**
Use of projectors in teaching improve students' academic achievement by enhancing retention of course material through visual aids.					
Use of PowerPoint slides for teaching enhances academic achievement by increasing students-teacher engagement					
I usually integrate educational videos in teaching process					
Integrating educational videos in the teaching process positively affects academic achievement by promoting active learning					

Integrating ICT in teaching saves time that could be used for revision with student to enhance academic achievement					
The use of teaching animations by teachers in my school leads to enhanced academic achievement					
Use internet to source for teaching content while preparing teaching notes leads to enhanced academic achievement					

Section C: ICT Integration in Examination Management

6) Kindly specify agreement level with every statement describing ICT integration in examination management in your school using 1-5 Likert scales in which 1 is StronglyDisagrees (SD), 2 is Disagrees(D), 3 is Neutral(N), 4 is Agrees(A) and 5 is StronglyAgrees(SA).

	1	**2**	**3**	**4**	**5**
Relying on ICT when setting midterm and end term examinations affects students' academic achievement					
Downloading questions for exams from online sites allows teachers to set challenging exams which motivates to make effort to achieve higher grades					
The integration of ICT in timetabling of exams					

saves time which can be used to revise for exams					
The analysis of examination using ICT tools like computer allows teachers to identify areas for students' academic improvement					
Having online examination portal for keeping exam records improve academic achievement by letting learners to monitor their progress and make informed decisions about their learning.					
Integrating ICT in exam management facilitate teachers in assessing learning outcomes					

Section D: ICT Integration in Learning resources' management

7) Kindly specify agreement level with every statement describing learning resources' management in your school using 1-5 Likert scales in which 1 is StronglyDisagrees (SD), 2 is Disagrees(D), 3 is Neutral(N), 4 is Agrees(A) and 5 is StronglyAgrees(SA).

	1	**2**	**3**	**4**	**5**
The integration of ICT in our school ensures there are electronic revision books available for every student to improve their academic achievement					
Teachers are able to access to electronic textbooks when ICT is integrated to improve students'					

academic achievement					
Teachers are able to access to electronic workbooks when ICT is integrated to improve students' academic achievement					
Both students and teachers can access test exams online in our school to improve students' academic achievement					
Students can access interpretation of certain concepts online which gives students avenues to improve academic achievement					

Section E: ICT Integration in Students' Data Management

8) Kindly specify agreement level with every statement describing ICT integration in students' data management in your school using 1-5 Likert scales in which 1 is StronglyDisagrees (SD), 2 is Disagrees(D), 3 is Neutral(N), 4 is Agrees(A) and 5 is StronglyAgrees(SA).

	1	**2**	**3**	**4**	**5**
The data of performance is monitored effectively through use of ICT tools which identifies areas to focus so as to improve academic achievement					
Integration of ICT have allowed teachers to effectively keep clear books allocations data					

Teachers monitor class attendance of students through use of ICT tools which ensure students are present in every in an effort to improve academic achievement					
Integration of ICT have made possible to keep students fee records which affects academic achievement as students can learn without interruptions					
Integration of ICT have made possible to store the performance history data of students which affects academic achievement since students' progress can be tracked					

Section F: Students' Academic Achievement

9) Please record data for the following aspects of students' academic achievement in the last 5 years.

	2018	**2019**	**2020**	**2021**	**2022**
Percentage of quality grades					
University transition rate					
Annual Mean grades					
Graduation rate					

10) Kindly specify agreement level with every statement describing the students' academic achievement of secondary schools in Kamukunji using 1-5 Likertscales in which 1 is StronglyDisagrees (SD), 2 is Disagrees(D), 3 is Neutral(N), 4 is Agrees(A) and 5 is StronglyAgrees(SA).

	1	**2**	**3**	**4**	**5**
Performance of students have improved over the last 5 years					
There has been an increase in university transition rate					
Most students have actively participated in extracurricular activities					
The Percentage of quality grades have increased over the last 5 years.					

Your Participation is Highly Appreciated

Appendix II: Research Questionnaire for Students

Kindly answer every question by selecting the suitable options**(✓)**.

Section A: Demographic Information

1) Age in years……..
2) Gender?

   Male [ ]

   Female [ ]

Section B: Integrating ICT in Teaching Process

3) Which of following does your teachers use when teaching in your school? Tick where appropriate

Power point presentation [ ]

Internet integration [ ]

Educational videos [ ]

Section C: Integrating ICT in Management of Examinations

4) Which of following does your teachers use when managing exams in your school? Tick where appropriate

   Exam setting [ ]

   Exam timetabling [ ]

   Exam analysis [ ]

Section D: ICT Integration in Managing Teaching and Learning Resources

5) In which of the areas is ICT applied in your school?

Access to e-revision books [ ]

Access to e-textbooks [ ]

Books distributions [ ]

Access to e-test exams [ ]

Section E: ICT Integration in Students in Data management

6) In which of following students' data management activities is ICT used in your school?

Students' performance data [ ]

Books allocations data [ ]

Managing Students class attendance [ ]

keeping Fees records [ ]

Your Participation is Highly Appreciated

Appendix III: Interview Guide for Principals and SCDE

Th-is is interview is conducted to evaluate the influence of integrating ICT in school operations on academic achievement of students in every secondary school. The data obtained will be utilized for academics only.

1) What is the status of integrating ICT in your school? Please elaborate
2) In which school operations has ICT been integrated in your school? Please elaborate your answer
3) What are some of the challenges have your faced while ICT in school operations?
4) How have you integrated ICT in teaching process in your school?
5) Kindly specify ways in which ICT integration in teaching process influences students' academic achievement in your school?
6) How have you integrated ICT in managing exams process in your school
7) Kindly specify ways in which integrating ICT in management of examinations influences students' academic achievement in your school?
8) How have you integrated ICT in learning resources' management in your school?
9) Kindly specify ways in which integrating ICT in learning resources' management influences students' academic achievement in your school?
10) Kindly specify ways in which integratingICT in students' data management influences students' academic achievement in your schools?

Thank you for Participating

Appendix IV: Letter of Introduction from UON

UNIVERSITY OF NAIROBI
FACULTY OF EDUCATION
DEPARTMENT OF EDUCATIONAL MANAGEMENT, POLICY AND CURRICULUM STUDIES

P.O. BOX 30197
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KIKUYU

dept-edpcs@uonbi.ac.ke

OUR REF: E55/38670/2020 **DATE:** 30th June, 2023

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

RE: RANDA EVANS - REG NO. E55/38670/2020

RANDA EVANS is a bona fide Master of Education student in the Department of Educational Management, Policy and Curriculum Studies University of Nairobi. He has completed his course work and is currently working on his research proposal. His area of specialization is Educational Planning. Topic ***'Influence of Information and Communication Technology Integration on Students' Academic Achievement in Secondary Schools in Kamukunji Constituency, Kenya.'***

Any assistance accorded to him will be highly appreciated. Thank you.

Dept Of Ed. Mngmt, Policy & Curriculum Studies
Chairman
P.O BOX 92 - 00902
Faculty Of Education

DR. SUSAN CHEPKONGA
CHAIRMAN,
DEPARTMENT OF EDUCATIONAL MANAGEMENT, POLICY AND CURRICULUM STUDIES
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