FACTORS INFLUENCING THE INTEGRATION OF ICT IN TEACHING AND LEARNING IN SECONDARY SCHOOLS: A CASE OF KIKUYU CONSTITUENCY, KENYA

BY

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DECLARATION

This research report is my own original work and has not been submitted to any University or Institution for the award of a degree.

Signature: ..... Date 25/7/2013

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Reg. No. L50/64390/2010

This is to certify that this research project report has been submitted for examination with my approval as University supervisor.

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DEDICATION

I would like to dedicate this piece of work to my family, Kariuki, Faith, Kenneth, Eva and Patrick, without whose support this work would not have been possible.

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ABBREVIATIONS AND ACRONYMS

APR - Annual Progress Report

CEMASTEA - Centre for Mathematics, Science and Technology Education in Africa

ESP - Economic Stimulus program

ICT - Information Communication Technology

K.C.S .E. - Kenya Certificate of Secondary Education

KEMI - Kenya Education Management Institute

KESSP - Kenya Education Sector support programme

LSD - Least Significant Difference

MCEETYA - Ministerial Council on Education, Employment, Training and Youth Affairs

MOE - Ministry of Education

MOEST - Ministry of Education Science and Technology

OECD - Organization for Economic Co-operation and Development

SPSS - Statistical Package for Social Sciences

TPACK - Technological, Pedagogical, Content, knowledge

UNESCO - United Nations Educational Scientific and Cultural Organization

VVOB - Flemish Association for Development, Cooperation & Technical Assistance

ABSTRACT

The purpose of this research was to establish the factors influencing the integration of ICT in teaching and learning in public secondary schools in Kikuyu constituency in Kiambu County. The objectives of this study were to establish the influence of teachers' perceptions on ICTs and ICT integration in teaching and learning, teachers' ICT skills training on integration of ICT, teachers' teaching workload and school management support have on level of ICT integration in secondary schools in Kikuyu constituency. Since 2010, Kenya has been providing secondary schools with ICT infrastructure for use development of students' skills in ICT and for use in teaching and learning in order to improve quality of Education. So far, 1470 public schools have been equipped with ICT infrastructure. Apart from doing this, the Ministry of Education (MOE) has trained a number of teachers as ICT champions to train teachers and principals in these schools. It is therefore important that the factors that hinder or support the integration are known as this would assist in capacity development of teachers and school managers and also assist in development of an ICT integration policy by the MOE. The design of this research was descriptive survey. Questionnaires were used to collect data from all teaching staff in the five schools in the constituency under the ESP (Economic Stimulus programme) and 100 students at form 11 level selected through random sampling. A semi-structured interview schedule was also used to collect data from all the principals in the five schools. The data collected from principals and students was used to correlate the information from the teachers. Collected data was analyzed using descriptive statistics and inferential statistics by means of the statistical package for social sciences (SPSS version 17). The data analysis was presented in form of frequencies, percentages, means and standard deviations. Correlation was used to determine the relationships between variables. Independent T-test and one- way ANOVA was used to test the statistical significance of the differences between variables. From this research, the level of ICT integration in teaching and learning in Kikuyu constituency is low and in particular among female teachers.Teachers' perception, ICT competencies and level of management support all affect ICT integration in teaching and learning. However, there is no significant influence of teachers' present teaching workload on level of ICT integration in teaching and learning. Training interventions for teachers should be organized in the use of ICT tools in teaching and learning. Such trainings should be subject based and have a component on attitude c

to help change teachers perception on ICT integration. More sensitization of education managers on the need to support teachers in ICT integration.

CHAPTER ONE

INTRODUCTION

1.1. Background to the study

Pelgrum and Law (2003) state that near the end of the 1980s, the term 'computers' was replaced by 'IT' (information technology) signifying a shift of focus from computing technology to the capacity to store and retrieve information. This was followed by the introduction of the term 'ICT' (information and communication technology) around 1992, when e-mail started to become available to the general public (Pelgrum, W.J., Law, N., 2003).

According to a United Nations report (1999) ICTs cover Internet service provision, telecommunications equipment and services, information technology equipment and services, media and broadcasting, libraries and documentation centres, commercial information providers, network-based information services, and other related information and communication activities. Adeya (2002) mentions about a more simplified definition describing ICTs as an 'electronic means of capturing, processing, storing and disseminating information'.

Jhurree (2005) argues that education reform is occurring throughout the world and one of its tenets is the introduction and integration of ICTs in the education system. The successful integration of ICTs into the classroom warrants careful planning and depends largely on how well policy makers understand and appreciate the dynamics of such integration (Jhurree, V., 2005).

Integration of ICTs in education has been a contentious issue (Jhurree, V., 2005). As Jhurree (2005) claims some people argue that technology will change the educational landscape forever and in ways that will engender a dramatic increase in the performance of learners (Papert, S., 1997). Unlike these extreme advocates, there are others who adopt a balanced approach (Jhurree, V., 2005). They are convinced that ICTs, if properly integrated, have the potential to enhance the teaching and learning process (Hepp, K., Hinostroza, S., Laval, M., Rehbein, F., 2004; Kozma, R., Wagner,D., 2003; Commission of the European Communities, 2001; UNESCO, 2003;Pelgrum, W.J., Law, N., 2003). Based on this argument, Information and communications technologies (ICT) are being

integrated in the teaching-learning process in many learning institutions of the world (Ertmer 2005; Juang et al. 2008; Friedman et al. 2009).

Since early 1990s, schools in Kenya have slowly but steadily been equipping themselves with computers, some at considerable costs, for the sake of being identified as having computers (Wabuyele, 2003; Wims & Lawler, 2007). In 1996 the Government through the ministry of education declared that all secondary schools should introduce computer studies. It was not clear how schools were to acquire the computers, as a result most schools failed to comply (Odera, 2002). Kenya Education Sector support programme (KESSP) MOEST(2005) has featured ICT as one of the priority areas with the aim of mainstreaming ICTs into the teaching and learning, the aim of this being to improve the quality of education.

In 2006, the ministry of education developed a national ICT policy framework to be implemented by the education and training sector. The section on information technology sets out the objectives and strategies pertaining to ICT and education. The relevant objective in this section states that government will encourage "...the use of ICT in schools, colleges,universities and other educational institutions in the country so as to improve the quality of teaching and learning" (Kenya ICT policy document,2006).

In vision 2030, Kenya recognises the importance of technology in raising productivity and efficiency across the three pillars namely social ,economic and political . The country recognises the critical role that education will play in development of the ICT skills. Consequently, from 2009, the government of Kenya disbursed funds Secondary Schools to be used in the purchase of ICT facilities for e-learning in the schools under the Economic Stimulus Programme (ESP) project. So far, 1470 schools have received funding (Ongeri S. Jan.2012). Kenya in 2010 also set up National ICT integration and innovation Centre (NI_3C) at Kenya Science University campus whose mandate is to support teachers in ICT interation among other functions. However, there is limited research in the use of ICT in Kenyan classrooms (Webuyele, 2003; Wims & Lawler, 2007) . Available research (Cox, 2000; Mumtaz, 2000; Smith & Broom, 2003; Franz & Breit, 2005) shows that teachers do not use these facilities to the fullest.Therefore, there is need to establish the factors that affect integration of ICT in teaching and learning, especially in ESP funded schools.

1.2. Statement of the Problem

From 2010, the government of Kenya disbursed funds to about 1470 Secondary Schools to be used in the purchase of ICT facilities for e-learning in the schools under the economic stimulus programme (ESP) project (ESP-ICT funded schools (2010-2011). The ESP is a short to medium-term, high intensity, high impact programme aimed at jumpstarting the economy towards long-term growth and development (APR 2011). Five schools in each constituency were provided with funds. (MOE, 2009). According to Gakuu et al (2008) while a lot of attention has been directed towards acquisition of ICT equipment in Kenya, little has been done to integrate them into teaching and learning.

Research conducted on use of ICT in Kenyan schools has mainly been on NEPAD e-schools and a few other schools (Ayere et al, 2010). However, research has not been conducted to establish factors influencing ICT integration in schools that received funding from the Ministry of Education under Economic Stimulus Programme (ESP) project. The purpose of this study is to establish factors influencing ICT integration in teaching and learning in ESP secondary schools in Kenya.

1.3. Purpose of the study

The purpose of this study was to identify the factors that influence integration of ICT in teaching and learning in secondary schools in ESP funded schools in Kikuyu constituency, of Kiambu County.

1.4. Research Objectives

This study had the following objectives:

i. Establish the influence of teachers' perceptions on ICTs and ICT integration in teaching and learning and level of integration of ICT in teaching and learning in Kikuyu constituency.

ii. Examine the influence of teachers' ICT competency skills on integration of ICT in teaching and learning in Kikuyu constituency.

iii. Assess the influence of teachers' teaching workload on integration of ICT in teaching and learning in Kikuyu constituency.

iv. Establish the influence of school management support on level of ICT integration in teaching and learning Kikuyu constituency.

1.5 Research questions

i. What is the influence of teachers' perceptions on ICTs and ICT integration on level of ICT integration in teaching and learning?

ii. What is the influence of teachers' ICT competency skills on level of ICT integration in the classroom?

iii. What is the influence of teachers' teaching workload on level of ICT integration in teaching and learning?

iv. What is the influence of school management support and level of ICT integration in teaching and learning?

1.6 Hypotheses for testing

Ho_1 There is no significant influence of teachers' perceptions on ICT and level of integration of ICT in teaching and learning

Ho_2 There is no significant influence of teachers' ICT competency skills on level of ICT integration in teaching and learning

Ho_3 There is no significant influence of teachers' teaching workload on level of ICT integration in teaching and learning

Ho_4: There is no significant relationship between school management support and level of ICT integration in teaching and learning.

1 7. Significance of the study

The study seeks to establish the factors that influence integration of ICT in teaching and learning in Kenyan secondary schools. The findings from this research will; assist the Ministry of Education in formulating policies on ICT integration in schools, identification of training needs among teachers and school administrators, that will be used by Pre-service and in-service providers (CEMASTEA &KEMI) in preparing training materials/curriculum for appropriate capacity development.

1.8. Limitations of the Study

The researcher carried out the study in the five public secondary schools in Kikuyu constituency of Kiambu County that benefited from Economic Stimulus Programme (ESP). This formed a representative sample of ESP schools in the county. This minimized the cost and time taken in data collection.

1.9. Delimitation of the Study

In this study the sample was drawn from form two students in the five public secondary schools. From the researchers' point of view, the form one students are still relatively new in the school, Form three students do not study all the subjects in the school while the form four class students are candidates and were being prepared for K.C.S.E. and therefore would not have had adequate time to respond to the questionnaire.

1.10. Basic assumptions of the study

The study was conducted under the following assumptions:

- Teachers, students and principals gave truthful and honest responses to the instrument items and were conversant with ICT integration requirements
- The study also assumed that Kikuyu constituency is not unique and that the findings would be a reflection of the situation on the ground in the rest of constituencies in Kiambu County.

1.11 Definition of significant terms

ICTs: ICTs stand for information and communication technologies.

ICT resources: These are diverse set of technological tools and resources used to communicate, create, disseminate, store, and manage information. For the purpose of this study ICT resources refer to computers, the Internet, telephony and others like camera that can store information. It also includes digital materials for teaching and learning.

ICT integration: ICT integration stands for the seamless incorporation of technology to support and enhance student engagement in meaningful learning and for attainment of curriculum objectives.

Public secondary schools: These are the government funded secondary schools.

Economic Stimulus programme: The ESP is a short to medium-term, high intensity, high impact programme aimed at jumpstarting the economy towards long-term growth and development (APR 2011). Through the programme schools were provided with funding for ICT resources.

Teaching workload: This refers to the number of lessons assigned to a teacher to teach per week.

School management: This refers to the principal, deputy principal and heads of departments in the school.

ICT skills training: This refers to ICT training at any level that would assist the teacher to use ICT resources in the classroom.

Kenya Certificate of Secondary Education (K.C.S.E.): This is the National examination administered to students in Form four in Kenya to mark completion of secondary education.

1.12. Organisation of the study

Chapter one gives the background of the study, the problem, significance of the study, and the questions answered by the study and any limitations of the study. It therefore shows the need to carry out the study. Chapter two is on literature review. It shows what other researchers have found as the factors influencing integration.Chapter three outlines the methodology that was used to answer the research questions. Chapter four gives the data analysis findings, their presentation, and interpretation done. The last chapter gives the summary of findings, discussions, conclusions and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This section presents an outline literature review relevant to the proposed study of "Factors influencing the integration of ICT in teaching and learning in secondary schools". This is a basic review whose purpose is to situate the study within existing research. It is based on research reports from various countries where ICT integration is taking place, journals, conference presentations and reviews of literature. The section is divided into subsections namely: ICTs social and economic impact, ICT in education, factors influencing ICT integration including teachers' perception, teachers' workload, Teachers' ICT skills, ICT resources availability and School leadership. It also describes the theoretical framework on which the study is based and the conceptual framework for the study. This review of literature helped to review the gap for study.

2.2. ICTs growing social and economic impact

Society at large is looking for economic improvement and empowerment for the current and future generation, and is ready and willing to provide the necessary resources to attain this goal. This means that poor countries aspiring for economic growth could invest in ICT which will act as a springboard to economic growth. It has been argued that bridging the 'digital divide' will level the economic playing field between the rich and poor nations (UNESCO, 2008).

Technical progress has given rise to tremendous social changes and very different ways of living over the last decade. The pace of change has clearly accelerated in the case of network-based services and applications. There has been a huge upsurge in mobile communications, a wide variety of digital media, and extensive digitalization of data-all this has led to availability and accessibility of information (Vander broucke, 2009)

Information and communication technologies represent a key driving force for growth and employment. A European Commission report (2005) reveals that ICT accounts for one-quarter of the rate of growth in the EU and 40% of the increase in productivity.

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2.4. ICT in Education

Information and communication technologies (ICTs) are indispensable and have been accepted as part of the contemporary world especially in the industrialized societies. In fact, cultures and societies have adjusted to meet the challenges of the knowledge age. The pervasiveness of ICT has brought about, rapid changes in technology, social, political, and global economic transformation. However, the field of education has not been unaffected by the penetrating influence of, information and communication technology (Ololube(2006) .

Kozma and Anderson (2002) write in their paper "ICT and Educational Reform in Developed and Developing Countries" that education is at the core of the knowledge economy and learning society and that correspondingly, the role of ICTs in schools is shifting dramatically. Knowledge creation, technology, technological innovativeness, and knowledge sharing can contribute to the transformation of the education system and to sustained economic growth and social development (Kozma (2005).

According to Hennessy et al (2010) in the Itupale Online Journal of African Studies, effectively introducing technology into schools is largely dependent upon the availability and accessibility of ICT resources (e.g. hardware, software and communications infrastructure). Clearly if technology cannot be accessed by the teacher, then it will not be used. They also noted that Schools are increasingly being equipped with computers for teaching, learning and administrative purposes, connectivity is improving and students are enthusiastic about using computers for learning, despite the lack of equipment. Some countries are developing digital content for use across the curriculum. Kenya for example

has development content for some classes through the Kenya Institute of Education (KIE).

There are a variety of opportunities for ICT in education. ICT in education can be used as a tool. Teachers may deploy ICT to keep an electronic agenda, an electronic pupil monitoring system or a grade book up to date or seek information they need to prepare their lessons. Pupils use ICT to produce presentations or to communicate with the teacher.

Apart from its usefulness as a tool ICT may make education more flexible by disconnecting teaching from time and space. This is valuable, for example, for adults eager to study outside daily education system, for work-based learning or children who are ill over a long period of time or people with disabilities.in these cases, ICT lends support for tailor-made education and more differentiated programmes. Owing to its flexibility, this e-learning system can increase the involvement in lifelong learning.

During the Second Information Technology in Education Study (SITES) seminar held in Japan in 2002, to discuss the role of ICT in education and the implication of integrating ICT in the daily learning practices that take place at schools researchers concluded that at that time there seemed to be a substantial international consensus that ICT was not longer conceived as an educational goal in itself (for learning about ICT, as it appeared to be the case during the 1980s and early 1990s) but rather as a tool that can help facilitate a reform of education towards introducing pedagogical approaches by which students would be stimulated to play a very active role in the learning process.

According to Hepp, Hinostroza, Laval and Rehbein (2004) some of the reasons for the application of ICTs in education are based on the fact that a new society requires new skills. ICTs are the preeminent tools for information processing,and therefore, new generations need to become competent in their use. They need to acquire the necessary skills, and therefore the need to access computers and networks during their school life.

Another reason is productivity enhancement noting that schools are knowledge-handling institutions;therefore, ICTs should be fundamental management tools on all levels of an educational system, from classrooms to ministries.Thirdly, a quest for quality learning. To achieve this schools should profoundly revise present teaching practices and

resources to create more effective learning environments and improve life-long learning skills and habits in their students.

All in all, ICT has become part of the society for communication between people,searching for entertainment and education, virtual meeting place, shopping and many more.Thus education plays a very important role to provide the platform and strong foundation to people.

2.4. Teachers' perception and ICT integration in the classroom

While there are many stakeholders involved in ensuring effective integration of ICT in the education system, teachers have a particularly important role to play. According to Carlson and Gadio (2002), teachers are the key to whether technology is used appropriately and effectively.

From the study carried out by Lau &Sim (2008) it appears that most teachers are positive with the use of ICT in school, and they appreciate the use of ICT in enhancing teaching and learning. Result also showed that they are positive towards further integration of technology into classroom instruction.

An interesting observation from SITE (2002) is that despite the problems that teachers experienced (including a higher work load) their enthusiasm about the innovation apparently overshadowed these experiences. SITES also noted that some teachers feared that achievement would suffer because of the inefficiency of the new approach (students loosing time with inefficient searchers, inadequate planning, etc.). Recent research seems to indicate that this fear is not purely hypothetical. Already from TIMSS-1995 onwards IEA is collecting a few indicators on ICT-use in science, mathematics and reading and noted low scores in Mathematics in students who relied so much on computers.

Tella et al (2007) examined Nigerian secondary school teachers' uses of ICTs and implications for further development of ICT use in schools using a census of 700 teachers. The findings showed that most teachers perceived ICT as very useful and as making teaching and learning easier. It was recommended that professional development policies should support ICT-related teaching models, in particular those that encourage both students and teachers to play an active role in teaching activities. Additionally,

emphasis should be placed on the pedagogy underlying the use of ICTs for teaching and learning.

Teachers' belief that ICT increases burden on their shoulders is an inhibitor to ICT integration. It is believed that ICT increases workload for teachers. It is generally agreed that lesson preparation using ICT is time consuming this is in accordance to an international conference on a study carried out in Vietnam (Dang, 2011).

Hutchison (2009),in his dissertation entitled "A national survey of teachers on their perceptions,challenges, and uses of information and communication technology" observed that teachers'ICT use increases with the perceptions about the extent to which students benefit from ICT integration. Teachers ICT use in the classroom depended on the stances teachers have on technology in the classroom. Therefore , it means that teachers attitudes and beliefs have a correlation to their ICT use in the classroom. This would thus mean that for full integration of ICT in the classroom, there is need for change of teachers attitudes not just provision of equipment.

2.5. ICT integration and teachers' workload and pedagogy

From OECD/Japan seminar (2002), ICT tools can greatly help to reduce workloads but teachers need to be trained to become aware of the availability and of how to use these tools. New ways will need to be found to maintain a cost-effective system of continuous staff development that is flexible enough to respond to quickly changing demands.

The ICT Impact Report (Balanskat, Blamire, & Kefala, 2006) and BECTA (2004a) states that ICT can increase teachers' enthusiasm and efficiency, promote their co-operation and planning with ICT, reduce their workload, help them alter their traditional pedagogical beliefs, implement new pupil-centred teaching strategies, and enhance stronger relationships between teachers and pupils, amongst others.

According to Ely (1999) ,one hindrance to ICT integration in schools is lack of time to prepare ICT teaching materials due to loaded curriculum.They also noted that converting manual teaching notes to ICT requires both time and skill. Teachers feel that this is also an added load and because there is no special reward and it is not part of the curriculum, there is no motivation.Nevertheless, for ICT to be integrated in teaching, it does not have to be part of the curriculum but rather a tool to help in teaching.

BECTA (2004b) identified lack of time for preparation of computer based lessons as one of the barriers to ICT integration.

According to research conducted by Pricewaterhouse coopers in England in 2003, entitled using ICT in schools:Addressing teacher workload issues, some teachers felt that ICT increased their workload, with certain tasks taking longer to complete with ICT. However, this perception can be linked with lack of ICT skills or confidence, ineffective school ICT network,lack of appropriate training or technical support or a school ICT strategy that does not focus on addressing workload.

More research concur that teachers' workload and time management was an inhibiting factor on the implementation of computer instruction in classroom (Guha, 2000).

According to research carried out in Malaysian Smart schools (2010),many teachers felt time was an important factor in ICT integration. The time factors could be divided into three categories. The categories were teacher's free time, lesson preparation time and teaching time. Teachers felt that free time is too short for preparation of ICT integrated lessons, they also felt that preparation time should be catered for and teaching time was not adequate if one were to integrate ICT in the lesson. All this is related to teachers' workload since the higher the number of lessons allocated to the teacher per week , the less the number of free lessons.

Understaffing in schools leads to high workload for teachers and hence less free time for lesson preparation.

2.6. Teachers' competency in ICT and ICT integration

Hornby (2006) defines skill as the ability to do something well. Skills development in this study will refer to special ability (or expertise) enabling one to perform an activity by using a computer efficiently and its related peripherals in either teaching or learning. Dalton (1998) asserts that training is directed at changing peoples' knowledge, experience, skills and attitudes.

While there are many stakeholders involved in ensuring effective integration of ICT in the education system, teachers have a particularly important role to play. According to Carlson and Gadio (2002), teachers are the key to whether technology is used appropriately and effectively in the school.

Several studies have attempted to relate adoption of ICT to teachers' skills in ICT. For example, while investigating the factors hindering teachers' readiness and confidence in using ICTs, Tella, et al.(2007) found that inadequate knowledge to evaluate the role of

ICT in teaching and learning, lack of skills in the use of ICT equipment and software had resulted in a lack of confidence in utilising ICT tools. This is consistent with Preston (2000) who concluded that lack of technical support to be key inhibitor to the use of ICT in classroom.

From study carried out in Malaysia (2008) to investigate teachers' ICT use in schools, their perceived competency, perception of ICTs, and their training and support needs concluded that most teachers are positive with the use of ICT use in school, and they appreciate the use of ICT in enhancing teaching and learning.but training should be offered to teachers on a continuous, rather than a one-off, basis so that their IT knowledge is upgraded over time.

According to Essay 111 (2010) on 'capacity building for ICT in Education', the focus for teacher training should be on design of multimedia modules, borderless training strategy and providing pre-service and in-service ICT training for teachers with the help of ICT-based resource packages designed by teachers for teachers under professional guidance and supervision. The objective of such training program should be to provide hands-on ICT learning opportunity for teachers to become more comfortable with technology, incorporating the Internet, Webpage design, and project-based approaches to support training.

According to UNESCO (2011) teachers' development on ICT-pedagogy integration goes through four stages namely emerging (applying productivity tools) applying (enhancing traditional teaching), Infusing (facilitating blended learning within or across subject areas), and Transforming (Creating & managing ubiquitous & interactive e-learning environments). This is because teachers need to become aware of ICT, learn how to use ICT in subject teaching, understand how and when to use ICT and specialize in the use/design of ICT.

2.7. ICT Resources availability and ICT integration

In order to have a teaching learning process or education system supported by technology, the availability of suitable infrastructure is essential (Law et al., 2000). This implies that it is very difficult to focus on implementation of technology to support learning unless schools are provided with basic technological infrastructure and facilities.

According to a presentation during an international conference on "ICT for Language learning" entitled Factors Influencing Teachers' Use of ICT in Language Teaching: A Case Study of Hanoi University, Vietnam,one major barrier to ICT integration is the lack of access to ICT equipment and training.

Although availability of ICT resources could be a barrier to integration, even when these resources are available, maintainance of the computers could also pose a threat to integration. This is according to research carried out on Ontarrio schools Reid S.(2002).

2.8. School leadership and ICT integration

The school leadership provides the direction and support in terms of school policy that outlines goals and also the necessary resources for the teachers. "Successful change and ICT implementation in schools depends on effective leadership" (Hepp 2004) "Strong and coherent leadership is an important factor in initiating and maintain the impetus of to promote quality ICT integration.

According to Afshari et al (2006), school principal is the key agent of change, who has a clear vision and implementation strategy for ICT with the main elements being staff development focusing on curriculum tailoring and pedagogic innovation. From research, they concluded that, Principals have a key role to play in the facilitation of educational change. At a time when information and communication technologies are being integrated into the classroom as learning tools, and when teachers are being asked to incorporate technology into their teaching practices, principals who demonstrate an initiator style are more likely to achieve success in their schools. However, these educational leaders should have the understanding and the skills both pedagogically and technically.

According to the research above, the principals provided support through stressing classroom applications of technology during staff meetings,organizing staff training, ensuring adequate time and resources for in-class computer use,and monitoring every teacher's progress by reviewing instruction plans and other written materials. I feel it is from this understanding that the principals in the schools under the ESP program have been taken through some training (MOE).

According to MCEETYA, Australia (2006), school leadership should provide teachers with necessary resources and professional learning opportunities, connect teachers to each other, and to experts and resources beyond the school, engage teachers in curriculum

teaching and learning, assessment, reporting and decision-making, leverage students' expertise and willingness to embrace ICT.

MCEETYA notes tnat transformative leadership that integrates information and communication technologies (ICT) to improve teaching and learning will be required in schools.Such leadership monitors and manages the access to, and impact of, ICT on all groups of students, engages all students with ICT in ethically, culturally sensitive and productive ways,and establishes a whole-school planned and sustained ICT integration program with quality technical support among others.

In the 21st century ,visionary leadership is needed that recognises the critical role of teachers in ensuring the power of information communication technologies is used to transform pedagogies and learning in schools. This leadership ensures teachers develop the knowledge,competence,skills and confidence to exercise professional judgement in utilising ICT in learning.

According to a research carried out in Kabale, Uganda in 2011 (Twinomujuni J.A., 2011),administration support is essential for ICT integration in schools.Yang (2008) concurs that lack of technical support was one of the major barriers that resulted in computers being underutilized in the classes. It can be argued that lack of training support by administrators could be identified as a significant barrier towards implementation of computers in classrooms as supported by Krysa (1998).

Webb (2007) has thus classified , barriers to ICT integration into three levels: the teacher and this usually to do with competence, motivation and training; the school: especially limited access to ICT and the absence of an ICT dimension in the overall school strategy; and the school system: rigidity of the school system, especially when linked with the wider educational framework.

2.9. Theoretical Framework

In order to effectively integrate ICT in the classroom, there has to be the content knowledge, pedagogical knowledge and the technological knowledge. The intersection of the three is the effective integration in the classroom. In this respect ICT is used as a tool to support teaching and learning processes, for example using a word processor, spreadsheet or database in other subject areas such as mathematics or science. This can be referred to as the seamless integration of ICT in the classroom. This can be summarised using the model below.

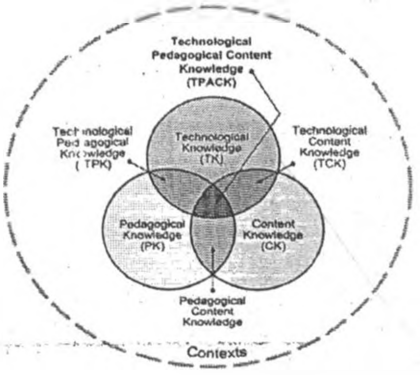

Figure 1: TPACK Model (source: Four in balance)

"TPACK is the basis of good teaching with technology and requires an understanding of the representation of concepts using technologies; pedagogical techniques that utilize technologies in constructive ways to teach content; knowledge of what makes concepts difficult or easy to learn and how technology can help redress some of the problems students face"(Mishra & Koehler, 2006; p. 1029).

According to Bingimlas (2009), ICT in the classroom is very important for providing opportunities for students to learn to operate in an information age. According to VVOB (2010), ICT can help teachers: improve the quality of lessons and contact with students, explain difficult topics, exchange learning materials and lesson plans, make teaching diversified and child centred and bring the reality of the world into the classroom. Nevertheless, ICT can never replace the inactive stage in learning where students need to do / experience something (solid, liquid, gas). It remains always important for a student to have a real experience.

BECTA (2003) points out that ICT provide fast and accurate feedback to students, and speed up computations and graphing, thus freeing students to focus on strategies and interpretation. Further,use of interactive multimedia software, for example, motivates students and leads to improved performance. In fact, studies showed that more students finished high school and many more consider attending college where they routinely learned and studied with technology (BECTA, 2003). Barak (2004) pointed further that the use of ICTs in education would promote deep learning, and allows schools to respond better to the varying needs of the students.

According to Kennisnet (2009), there needs to be a balance between vision, expertise, digital learning-materials and the ICT infrastructure for benefits from ICT integration to

be realized. Teachers need a shared vision on how ICT should be used in the classroom. The se four basic elements need to be coordinated but teachers alone cannot create this cohe sion. Support from school managers is necessary. The managers provide leadership in this process and create conditions for support and collaboration with other profes sionals. The figure below shows the various elements as they relate to one another.

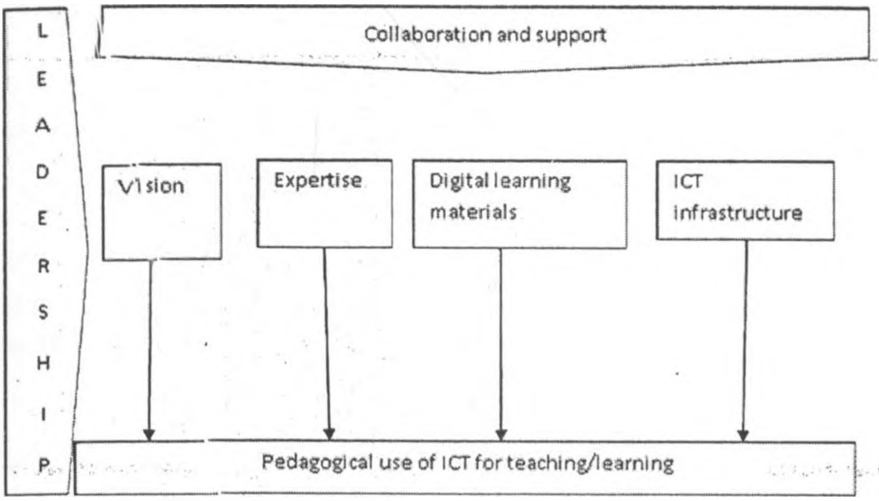

Figure 2. Basic elements of four in balance (Four in balance monitor 2009

2.10. Conceptual framework

The conceptual framework for the study forms the basis for the research package and provides conceptual tools to critically analyze and promote more fruitful approaches to the given variables. Teachers are significant players in the implementation of ICT in the classroom since they organize teaching in the classroom and develop lessons. They determine the method to use in the delivery of the lessons. This study will consider the following variables that affect the effectiveness of teachers' use of ICT in the classroom: teacher competence (training), perception of teachers about ICT integration in the classroom, teachers' work load, availability of resources and accessibility, and support from school management. In this research the independent and dependent variables are interrelated in approach.

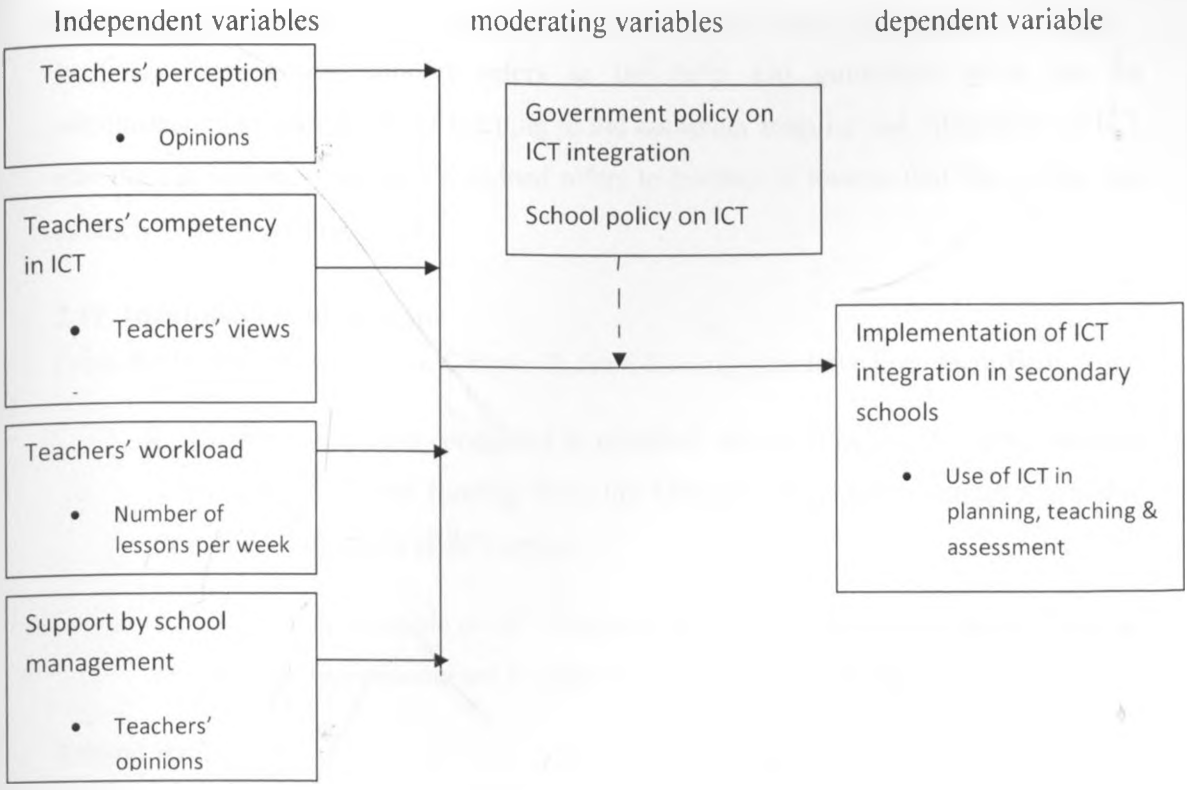

Figure 2.3: Conceptual framework

In this study, the dependent variable is implementation of ICT integration in the classroom. ICT is an umbrella term that includes all technologies for the communication of information (Brock, 2000). For the purpose of this study, ICT will be used to refer to computers and digital materials which are primarily designated for student use. Surry and Ely (2001) define implementation as the process of introducing an innovation into an organization and fostering its use. In an information technology context, implementation encompasses all the processes involved in getting new software or hardware operating properly in its environment, and making necessary changes. Integration in the classroom means the use as a tool to enhance teaching and learning. The independent variables in this study are the factors influencing integration of ICT in the classroom. These are the situations that hinder the accomplishment, result, or process. In this study factors that will be considered are; teachers' perceptions which refers to teachers attitudes towards ICT and ICT integration, teachers' skills development in ICT, availability and accessibility of resources (computers and digital materials) and administrative support. Teachers' Skills development in ICT in this study refers to special ability (or expertise) enabling one to

perform an activity by using a computer and its related peripherals in either teaching or learning. Management support refers to the help and guidelines given out by administrators in institutions of learning to aid computer training and integration of ICT into the curriculum. Teachers' workload refers to number of lessons that the teacher has to teach in the school per week.

2.11. Identification of the gap

From the review of literature in Chapter 2, the following gaps have been identified:

1. Research has not been conducted to establish factors affecting ICT integration in schools that received funding from the Ministry of Education under Economic Stimulus Programme (ESP) project.

2. Little research available on ICT integration in Kenya secondary schools. Most of research has been conducted in schools in developed countries.

Ethical issues

All participants in the survey were given guarantees of confidentiality. It was made clear that it was all information was for purpose of research only.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1. Introduction

This chapter covers the research design, target population, sample and sampling technique, research instruments, data collection and data analysis techniques. It gives an explanation and description of the sample, information about the development of the survey instrument, including efforts to establish its validity, a description of a pilot study, including data collection procedures; and a description of the methods used to analyze data.

3.2. Research design

Borg and Gall, (1987) identifies research design as a process of creating an empirical test to support or refute knowledge claims. This study aimed at studying conditions or events that have already occurred and do exist. This study therefore used descriptive survey design. According to Kerlinger (1983) this is a systematic empirical enquiry in which the researcher does not have direct control of independent variables.

A descriptive survey design was chosen for this study because it is not possible to manipulate the variables of the study like sex, teaching experience, academic qualification, teaching load and knowledge in ICT. In addition, the study attempted to investigate those factors that already have an influence on integration of ICT in the classroom. These factors include teacher preparedness, perception, administrative support and teachers' teaching load.

Descriptive Survey research design was used in this study. This study gathers data at a particular point in time with the intention of describing the nature of the existing conditions, identifying the standards against which existing conditions can be compared and determining the relationship that exists between specific events (Orodho, 2005). According to Cohen et al (1994), descriptive survey designs are used in preliminary or exploratory studies to allow researchers to gather information, summarize, present and interpret for the purpose of clarification.

In this research mixed approach was used that is qualitative and quantitative data was collected. According to Francisco et al (2001), qualitative methods provide greater depth of understanding about a limited number of subjects, while as quantitative methods give a

less in-depth understanding, but cover a wider scope of subjects. In addition, qualitative approaches do not capture trends and patterns across the study population and also do not enable generalization to the whole population. On the other hand, with quantitative approaches it is difficult to quantify feelings or perceptions of teachers and also may lead to researcher bias as the questions asked could be leading to the research participants. Qualitative methods have also been said to be less systematic, and therefore less likely to be generalized to a wider population while quantitative systematic approach lends itself to replication. Using mixed approach gives a more powerful research where the analysis of data collected will be free from the "...wasteful schism between 'quantitative' and 'qualitative' methods..." Gorard, 2003, p. 229). Therefore, a complementary mixture of quantitative and qualitative data will be sought in the methods used where the strengths of each approach can be utilized to the full.

Mixed methods take on the good aspects of both the positivists and the anti-positivists world views. This leads us to pragmatism (Creswell, 2003) which draws from both world views: researcher is not committed to one system, gives the researcher freedom of choice that is to choose methods, procedures and tools that suit specific needs and views truth as what matters at that time, for example, what one thinks about technology can change over time and therefore will accordingly affect their use of technology.

3.3. Target population

Mugenda and Mugenda (1999), defines a population as a complete set of individuals, cases or objects with some common observable characteristics. A target population is that population to which a researcher wants to generalize the results of a study.

The target population was all the five public secondary schools under the ESP programme in Kikuyu constituency (Kiambu County). These are among the 1470 schools so far under this programme. The research targeted all the teachers teaching in each of the five schools. Five principals and 30% of form II students were involved in the study. Kerlinger (1970) suggests that 30% of a sample population is appropriate for the purpose of research.

3.4. Sampling technique

Purposive sampling of the constituency in Kiambu County was done. This was to the convenience of the researcher. A censor was done of five public secondary schools under the ESP programme in Kikuyu constituency (Kiambu County). The five schools were

selected because they are the ones that received funding for ICT infrastructure under the ESP programme. All teachers in each of the five schools were used. During the analysis teachers were grouped into five categories that is mathematics, sciences, languages, humanities and technical subjects. The five principals of these schools and 30% of form II students were also randomly sampled and involved in the study. Piloting of the instruments was done in one of the schools under the ESP program in Nairobi. Based on these the samples were as shown in the table below:

Demographic characteristics of the respondents

Category	Number
Principals	5
Teachers	73
Students	100
Total	**178**

Figure 3.1. Sample size

3.5. Data collection instruments

The data collection instruments which were used in this study were designed and developed by researcher. The study used questionnaires for teachers and students and interview schedule for principals. These are briefly discussed below:

Questionnaire

This is a collection of items to which a respondent is expected to react in writing. The questionnaire was structured in such a way that the respondents were expected to respond to all the questions that aided in meeting the research objectives. The teachers' questionnaire, which was the main tool for the research was divided into five sections namely: background information, teachers' perception on ICT integration, teachers' capacity development in use of ICT tools, use of ICT in teaching subjects and management support for teachers in ICT. The items were rated on a 4-point likert scale. The students' questionnaire had two sections,: Background information, expertise in computer use, use of ICT in class by teachers and uses of computers by students.

Interview schedule

The study also employed the use of interview schedule as a method of collecting data. Face to face interviews with the 5 principals was conducted. Structured and semi-structured interview questions were used. The reason for use of interviews was that they are easy to administer since the questions were prepared in advance. They also allow a great deal of information to be gathered in a short period of time. Interviews also help seek clarification through probing. The questions that were asked were confidential between the researcher and the respondents.

3.6. Methods of data collection

Survey method was used in data collection whereby two approaches were used namely qualitative and quantitative approaches. Qualitative data was collected using both the teachers' questionnaire and the interview schedule while quantitative data was gathered using the questionnaires.

During data collection, the researcher visited the schools and administered the instruments (face to face) with the help of school administration. The researcher explained the purpose of the study and assured the respondents of confidentiality.

3.7 Validity

Validity is the degree to which an instrument measures what it claims to measure (Dalem, 1970). Mugenda and Mugenda (1999) define validity as the accuracy and meaningfulness in inferences, which are based on the research results. The content validity was used to measure the degree of accuracy in the data collected using the questionnaires.

To enhance the validity of the questionnaires and interview schedules, piloting was conducted in one school with 5 teachers, 20 students and 1 principal filling in the questionnaire. The research administered the questionnaires to ensure that all items were clear. This ensured that there was no misinterpretation of items when administered to the respondents in the main study. The following formula was used to calculate content validity index.

$$\text{Content Validity Index} = \frac{\text{Total number of items rated as valid}}{\text{Total number of items on the instrument}}$$

Using this, content validity index of 0.8 was obtained. The questionnaires and interview tools were also discussed with colleagues and some items were either modified or removed.

The use of multiple sources of data (teachers, principals and students) referred to as triangulation also enhanced validity (Robsin, 2000).

3.8. Reliability

Internal consistency reliability was done which is a measure of reliability used to evaluate the degree to which different test items that probe the same construct produce similar results. Split-half reliability test was used. This means splitting in half all items of the test in each section in order to form two "sets" of items. The entire test was administered to the pilot group. The total aggregate score for each "set" was computed, and finally the split-half reliability was obtained by determining the correlation between the two total set scores. Pearson Product Moment Correlation was used on an excel sheet (Oregon Department of Education, March 2010). A score of 0.84 was obtained. The items were therefore reliable. Reliability was enhanced by triangulation where the same facts were elicited for from different people in the same setting. In this particular instance, comparison of questionnaire results from the principals, the teachers, and the students in the same school, thereby enhancing the reliability of the results through triangulation.

3.9.Operationalisation of variables

Objectives	Research questions	Variables/indicators	Type of analysis
Establish the influence of teachers' perceptions on ICT has influenced level of integration of ICT in teaching and learning	What is the influence of teachers' perceptions on ICTs and ICT integration on level of ICT integration in teaching and learning?	Teachers' perceptions towards ICT integration-opinions as rated on likert scale	Means independent samples t-test ANOVA
Examine the influence of teachers' ICT skills training on integration of ICT in teaching and learning	What is the influence of teachers' ICT skills training on level of ICT integration in the classroom?	Teachers' assessment of their skills training-opinions as rated	Means Independent samples t-test ANOVA
Examine the influence of	What is the influence of	Views of teachers' on workload	Means Independent t-test

teachers' ICT skills training on integration of ICT in teaching and learning	teachers' teaching workload on level of ICT integration in teaching and learning?		ANOVA
Establish the influence of school management support on level of ICT integration in the classroom	What is the influence of school management support and level of ICT integration in teaching and learning?	Level of school management support –opinions as rated on scale	Means Independent t-test ANOVA

Table 3.2. operational definitions

3.10. Data analysis

The survey contained quantifiable data i.e. data that can be counted, compared, and analysed numerically e.g. gender.After data collection stage, all the structured items of the questionnaires were keyed into the computer and analyzed using the Statistical Package for Social Sciences (SPSS) version 17 of program of a computer. The core of the questionnaire was analyzed using t-test to determine the significant relationship between the various variables. One-way-analysis of variance ANOVA was employed to test the significance of the relationship between three or more variables. Descriptive statistics (Means) was used for the demographic variables such as teaching experience, gender,and educational background.Data collected with the interview guide was used to collelate information provided by teachers and students.

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION, AND INTERPRETATION

4.1 Introduction

In this Chapter, findings are presented and interpreted in two sections. Section 4.2 presents some background information of respondents while sections 4.3 present findings and interpretations for each of the four research questions in this study.

4.2 Background Information

The background information that was sought from respondents in this study included: gender; educational qualification; teaching experience; teaching subjects; and workload (number of lessons taught per week). The findings are presented in sub-sections 4.2.1 to 4.2.5.

4.2.1 Gender

Respondents were required to indicate their gender and the data that was obtained was used to compute frequencies and percentages. The results are presented in Table 4.1.

Table 4. 1: Gender of Respondents

Gender	Frequency	Percentage
Male	37	50.7
Female	36	49.3
Total	**73**	**100.0**

The results in Table 4.1 show that respondents were balanced by gender.

4.2.2 Educational qualifications

Respondents were required to indicate their educational qualifications and the data that was obtained was used to compute frequencies and percentages. The results are presented in Table 4.2.

Table 4. 2: Educational qualifications

Education qualification	Frequency	Percentage
PhD	0	0.0
Masters	19	26.0

B.Ed & BSc + PGDE	50	68.5
Diploma in Education	4	5.5
Total	**73**	**100.0**

4.2.3 Teaching experience

Respondents were required to indicate their teaching experience and the data that was obtained was used to compute frequencies and percentages. The results are presented in Table 4.3.

Table 4. 3: Teaching experience in years

Teaching experience (years)	Frequency	Percentage
Above 24 yrs	4	5.5
15-24 yrs	39	53.4
10-14 yrs	14	19.2
Below 10 yrs	16	21.9
Total	**73**	**100.0**

4.2.4 Teaching subject

The subjects offered at the secondary school education cycle in Kenya were grouped into five groups. In this study, respondents were teaching the following subjects:

- Group 1: mathematics
- Group 2: languages (English & Kiswahili)
- Group 3: science (Biology, Physics & Chemistry)
- Group 4: humanities (CRE, Geography & History and Government) and
- Group 5: technical and applied subjects (Home Science, Agriculture & Business Education).

Respondents were required to indicate their first teaching subject and the data that was obtained was used to compute frequencies and percentages. The results are presented in table 4.4

Table 4. 4: Teaching subject

Subject	f	%
Mathematics	10	13.7
Languages	19	26.0

Science	15	20.5
Humanities	19	26.0
Technical and Applied Subjects	10	13.7
Total	**73**	**100.0**

4.3 Presentation of Findings

This study sought to determine the influence of four factors (independent variables) on integration of ICT in teaching and learning in secondary schools. These factors were:

Teachers' perception of ICT integration; level of teachers' capacity development in use of ICT tools; workload and management support for teachers' use of ICT. The dependent variable was level of teachers' use of ICT in teaching their subjects. . In this section, the findings are presented in six sub-sections 4.3.1 to 4.3.6. The first sub-section (4.3.1) focus on ICT integration in teaching and learning. The next four sub-sections (4.3.2-4.3.5) address each of the four research hypothesis while the fifth sub-section (4.36) compares the four predictor factors to determine their relative influence on the level of teachers' use of ICT in teaching their subjects. The findings are presented in tables and figures as appropriate.

4.3.1 ICT Integration in Teaching and Learning

In this study, the level of ICT integration was measured with 13 items. These items were positive statements that focused on teachers' use of various ICT tools in; preparation of lesson plans, lesson notes and students' worksheets, analysis of students marks, storage of students records, presentations for classroom instructions, accessing educational materials in the internet and collaboration with other teachers through the social media. The respondents were required to rate the 13 statements on a four point rating scale of 1-4 as follows: very frequently (4); frequently (3); rarely (2) and never (1). For each respondent, the responses were summed up to obtain an aggregated ICT integration score which was expressed as a percentage. A high ICT integration score indicated a high level of ICT integration while a low score indicated low level of ICT integration in teaching and learning. In this study the level of ICT integration was categorized into three levels; high, satisfactory and low and Table 4.5 show the benchmarks and standards of interpretation of the three levels of ICT integration score.

Table 4. 5: Benchmarks and Interpretation of Level of ICT Integration

Level of ICT Integration Score	Interpretation
75-100	High level of ICT Integration
50-74	Satisfactory level of ICT Integration
< 50	Low level of ICT Integration

The data that was obtained was used to compute the mean ICT integration score and the results are presented in Table 4.6.

Table 4. 6: Mean ICT Integration Score

Variable	N	Mean	SE	SD
ICT Integration score	73	34.0	1.88	16.02

The results in Table 4.6 show the mean ICT integration score was 34.0% and based on the set benchmarks and standards of interpretation in this study, the level of level of ICT integration in teaching and learning was low.

Further comparisons of the level of ICT integration was made against four background information of gender, educational qualifications, teaching experience and first teaching subject.

4.3.1.1 Level of ICT integration and Gender

The mean level of ICT integration in teaching and learning by gender was computed and the results are presented in Tables 4.7.

Table 4. 7: Mean ICT Integration Score against Gender

Sex	N	Mean	SE	SD
Male	37	40.6	2.49	15.17
Female	36	27.0	2.33	13.96
Total	73	34.0	1.88	16.02

The results in Table 4.7 show that male respondents had a higher level of ICT integration in teaching and learning compared to female respondents. This finding implies that teachers' gender may be a factor that can influence ICT integration in teaching and learning. The level of ICT integration score by gender was subjected to independent

samples t-test to determine whether the observed mean differences between male and female teachers were statistically significant. The results are presented in Table 4.8.

Table 4. 8: Independent Samples T-Test of Mean Level of ICT Integration Score against Gender

Sex	N	Mean	SD	SE	t	df	P
Male	37	40.6	15.17	2.49	3.980	71	0.000
Female	36	27.0	14.00	2.33			

The results in Table 4.8 shows that the observed mean difference in level of ICT integration score between male and female teachers is statistically significant in favour of male teachers at t =3.980, df=71, p=0.0001. Therefore education managers should explore why female teachers have a lower level of ICT integration in teaching and learning as this is likely to affect uptake of ICT integration in education. Likewise strategies should be formulated to encourage uptake of ICT tools in teaching and learning by female teachers.

4.3.1.2 Level of ICT integration and educational qualifications

The mean ICT integration score in teaching and learning against teacher educational was computed and the results are presented in Tables 4.9.

Table 4. 9: Mean ICT integration score against educational qualifications

Education qualifications	N	Mean	SE	SD
Masters' Degree	19	39.3	4.84	21.08
B.Ed & BSc + PGDE	50	33.0	1.75	12.37
Diploma in Education	4	20.2	11.64	23.28
Total	73	34.0	1.88	16.02

The results in Table 4.9 show there were mean differences in ICT integration score between teachers of difference education qualifications. The results further show that the

higher the education qualification, the higher the level of ICT integration in teaching and learning. One Way ANOVA was conducted on ICT integration score against the education qualifications to determine whether the observed mean differences were statistically significant. The results are presented in Table 4.12.

Table 4. 10: One Way ANOVA of mean ICT integration score against education qualifications

	Sum of Squares	df	Mean Square	F	P
Between Groups	1352.882	2	676.441	2.765	0.070
Within Groups	17123.759	70	244.625		
Total	18476.641	72			

The results in Table 4.10 shows that the mean differences in ICT integration score was not statistically significant at $F(2, 70) = 2.765$, $p=0.07$.

4.3.1.3 Level of ICT integration and teaching experience

The mean ICT integration score was computed against teaching experience and the results are presented in Tables 4.11.

Table 4. 11: ICT integration and teaching experience

Teaching experience in years	N	Mean	SE	SD
>24	4	42.2	9.60	19.20
15-24	39	29.8	2.44	15.25
10-14	14	36.3	5.12	19.16
<14	16	39.7	3.03	12.14
Total	73	34.0	1.88	16.02

The results in Table 4.11 show that there are differences in mean ICT integration score based on teaching experience. Generally, the mean ICT integration score declines with increasing teaching experience. One Way ANOVA was conducted on ICT integration score against the teaching experience to determine whether the observed mean differences were statistically significant. The results are presented in Table 4.12.

Table 4. 12: One Way ANOVA of mean ICT integration score against teaching Experience

	Sum of Squares	df	Mean Square	F	P
Between Groups	1548.477	3	516.159	2.104	0.108
Within Groups	16928.164	69	245.336		
Total	18476.641	72			

The results in Table 4.12 show that the mean differences in ICT integration score against teaching experience were not statistically significant at F(3, 69) =2.104, p=0.108.

4.3.1.4 ICT integration and teaching subject

The mean ICT integration score was computed against teaching subject and the results are presented in Tables 4.13.

Table 4. 13: Mean ICT integration Score and Teaching Subject

Teaching subject	N	Mean	SE	SD
Mathematics	10	40.3	3.92	12.41
Languages	19	31.3	3.22	14.02
Science	15	40.4	4.56	17.67
Humanities	19	26.2	2.47	10.77
Technical & Applied	10	37.4	7.19	22.74
Total	73	33.9	1.88	16.02

Subject Groups Languages (Kiswahili & English), Science (Biology, Physics & Chemistry), Humanities (CRE, Geography & History), Tech & Applied (Agri, H/Sc, Business Education)

The results in Table 4.13 show that there are differences in mean ICT integration score by teaching subject. The teachers of science and mathematics had the highest mean ICT Integration Score at 40.4% and 40.3% respectively while teachers of humanities had the lowest score at 26.2%. This finding may imply that the uptake of ICT integration in teaching and learning has a bearing on the teaching subject of a teacher.

One Way ANOVA was conducted on the ICT integration score against the teaching subject to determine whether the observed mean differences in ICT integration score were statistically significant. The results are presented in Table 4.14.

Table 4. 14: One Way ANOVA of mean ICT integration score against teaching subject

	Sum of Squares	Df	Mean Square	F	P
Between Groups	2440.950	4	610.237	2.588	0.044
Within Groups	16035.691	68	235.819		
Total	18476.641	72			

Use of ICT score

The results in table 4.14 shows that the mean differences in ICT integration score against teaching subject were statistically significant at $F(4, 68) = 2.588$, $p=0.044$. This finding confirms that uptake of ICT integration in teaching and learning may be different in teachers teaching different subjects. LSD post hoc multiple comparison test was conducted to locate the significant differences (Appendix VII). Significant mean differences were located between: mathematics and humanities in favour of mathematics; science and humanities in favour of sciences. However, there were no significant differences between mathematics, science languages and technical & applied subjects. These findings are further confirmation that the teaching subject has a bearing on the level of ICT integration in teaching and learning. Therefore, education managers should design content specific interventions that promote ICT integration in teaching and learning to address the specific needs of teachers in different subjects rather than being general in nature.

4.3.2 Teachers' perception of ICT and ICT Integration

In this study, teachers' perception of ICT integration was measured using 18 items that focused on teachers' perception of role of ICT tools in improving teaching and learning. The 18 items were positive statements which respondents were expected to rate using a four point rating scale of 1-4 as follows: strongly agree (4); agree (3); disagree (2) and strongly disagree (1). For each respondent, the responses were summed up to obtain an aggregated teacher ICT integration perception score which was expressed as a percentage. A high teacher ICT integration perception score indicated that a teacher had

a high perception while a low score indicated that a teacher had a low perception of ICT integration in teaching and learning. In this study the level of perception of ICT integration in teaching and learning was categorized into three levels; high, satisfactory and low and table 4.15 show the benchmarks and standards of interpretation of the three levels of perception of ICT integration score

Table 4. 15: Benchmarks and interpretation of perception of ICT integration

Perception of ICT Integration Score	Interpretation
75-100	High level of perception of ICT Integration
50-74	Satisfactory level of perception of ICT Integration
< 50	Low level of perception of ICT Integration

The data that was obtained was used to compute the mean teachers' perception of ICT integration score and the results are presented in table 4.16.

Table 4. 16: Mean perception of ICT integration score

Variable	N	Mean	SE	SD
Perception of ICT Integration score	73	50.8	0.91	7.79

The results in Table 4.16 show that the mean perception of ICT integration score was 50.8%. Based on the set benchmarks and standard of interpretation for this study, respondents had a low perception of ICT integration in teaching and learning. Consequently, the school management, education managers and policy makers should be made aware of this low teacher perception of ICT integration in teaching and learning as it is likely to derail the government policy of full integration of ICT in education.

Further comparisons of teacher's perception of ICT integration were made against the four background information of gender, educational qualifications, teaching experience and first teaching subject.

4.3.2.1 Perception of ICT integration and gender

The mean teachers' perception of ICT integration in teaching and learning by gender was computed and the results are presented in Tables 4.17.

Table 4. 17: Mean perception of ICT integration score against gender

Gender	N	Mean	SE	SD
Male	37	54.1	1.25	7.60
Female	36	47.3	1.07	6.44
Total	73	50.8	0.91	7.79

The results in table 4.17 show that male respondents had a higher mean perception of ICT integration in teaching and learning compared to female respondents. This finding implies that teachers' gender may be a factor that can influence ICT integration in teaching and learning. The teachers' perception of ICT integration score by gender was subjected to independent samples t-test to determine whether the observed mean differences between male and female teachers were statistically significant. The results are presented in Table 4.18.

Table 4. 18: Independent Samples T-Test of mean perception of ICT integration score against gender

Gender	N	Mean	SD	SE	t	df	P
Male	37	54.1	7.60	1.23	4.093	71	0.000
Female	36	47.3	6.44	1.07			

The results in Table 4.18 shows that the observed mean differences in perception of ICT integration score between male and female teachers is statistically significant in favour of male teachers at t =4.093, df=71, p=0.0001. Therefore education managers should explore why female teachers have a lower perception of ICT integration in teaching and learning as this is likely to affect uptake of ICT integration in education. Likewise strategies should be formulated to encourage uptake of ICT tools in teaching and learning by female teachers.

4.3.2.2 Perception of ICT integration and education qualifications

The mean teachers' perception of ICT integration in teaching and learning against education qualification was computed and the results are presented in Tables 4.19.

Table 4. 19: Mean perception of ICT integration score against education qualifications

Education qualifications	N	Mean	SE	SD
Masters' Degree	19	53.3	2.55	11.11

B.Ed & BSc + PGDE	50	49.1	0.79	5.56
Diploma in Education	4	59.1	2.81	5.62
Total	73	50.8	0.91	7.79

The results in table 4.19 show there were mean differences in perception of ICT integration score between teachers of difference education qualifications. Teachers with a diploma in education had the highest perception while those with B.Ed & BSc + PGDE had the lowest perception. One Way ANOVA was conducted on the perception of ICT integration score against the education qualifications to determine whether the observed mean differences in perception of ICT integration score by educational qualification were statistically significant. The results are presented in Table 4.20.

Table 4. 20: One Way ANOVA of Mean Perception of ICT Integration Score Against Education Qualifications

	Sum of Squares	df	Mean Square	F	P
Between Groups	536.309	2	268.154	4.900	0.010
Within Groups	3830.661	70	54.724		
Total	4366.969.	72			

The results in table 4.20 shows that the mean differences in perception of ICT integration score was statistically significant at $F(2, 70) = 4.900$, $p=0.01$. Therefore education managers and policy makers should design strategies and in-service courses in ICT integration in teaching and learning that targets specific categories of teachers based on their professional qualifications. LSD post hoc multiple comparison tests were conducted to locate the significant differences and the results are presented in Table 4.21.

Table 4. 21: LSD Post Hoc Multiple Comparison Test

(I) Education qualification	(J) Education qualification	Mean Difference (I-J)	Std. Error	Sig.
Masters	BEd & BSc + PGDE	4.210(*)	1.9937	0.038
	Diploma in Education	-5.743	4.0695	0.163
BEd & BSc + PGDE	Masters	-4.210(*)	1.9937	0.038

	Diploma in Education	-9.952(*)	3.8439	0.012
Diploma in Education	Masters	5.743	4.0695	0.163
	BEd & BSc + PGDE	9.952(*)	3.8439	0.012

** The mean difference is significant at the .05 level.*

The results in Table 4.21 show that significant differences in mean perception of ICT integration in teaching and learning were located between teachers with Masters and Diploma in Education against teachers with BEd & BSc+PGDE.

4.3.2.3 Perception of ICT integration and teaching experience

The mean teachers' perception of ICT integration in teaching and learning against education qualification was computed and the results are presented in Tables 4.24.

Table 4. 22: Perception of ICT integration and Teaching Experience

Teaching experience in years	N	Mean	SE	SD
>24	4	42.4	2.09	4.17
15-24	39	52.2	1.17	7.32
10-14	14	45.9	1.80	6.74
<14	16	53.7	1.89	7.56
Total	73	50.8	0.91	7.79

The results in table 4.22 show that there are differences in mean perception of ICT integration score based on teaching experience. Generally, the mean perception of ICT integration declines with increasing teaching experience. One Way ANOVA was conducted on the perception of ICT integration score against the teaching experience to determine whether the observed mean differences in perception of ICT integration score were statistically significant. The results are presented in table 4.23.

Table 4. 23: One Way ANOVA of mean perception of ICT integration score against teaching experience

	Sum of Squares	df	Mean Square	F	P
Between Groups	830.372	3	276.791	5.400	0.002
Within Groups	3536.598	69	51.255		
Total	4366.969	72			

The results in table 4.23 show that the mean differences in perception of ICT integration score were statistically significant at F (3, 69) =5.400, p=0.002. This finding implies that

uptake of ICT integration in teaching and learning may be slower among older teachers compared to the younger teachers. Consequently, education managers should design strategies targeting promoting uptake of ICT integration by older teachers.

4.3.2.4 Perception of ICT integration and teaching subject

The mean teachers' perception of ICT integration score against teaching subject was computed and the results are presented in table 4.24

Table 4. 24: Perception of ICT integration and teaching subject

Teaching subject	N	Mean	SE	SD
Mathematics	10	47.0	1.67	5.27
Languages	19	49.9	2.19	9.53
Science	15	56.8	1.43	5.53
Humanities	19	48.0	1.57	6.83
Technical & Applied	10	52.4	1.93	6.11
Total	73	50.8	0.91	7.79

The results in table 4.24 show that there are differences in mean perception of ICT integration score by teaching subject. Science teachers had the highest mean perception score followed by technical and applied subject teachers. Meanwhile the humanities teachers had the lowest mean perception of ICT integration score. Since perception is likely to affect teachers uptake of ICT integration, education managers should design ICT course content that incorporate components that promote positive perception of ICT integration among teachers.

One Way ANOVA was conducted on the perception of ICT integration score against the teaching subject to determine whether the observed mean differences in perception of ICT integration score by teaching subject were statistically significant. The results are presented in Table 4.25.

Table 4. 25: One Way ANOVA Of Mean Perception of ICT Integration Score Against Teaching Subject

	Sum of Squares	df	Mean Square	F	P

Between Groups	877.675	4	219.419	4.276	0.004
Within Groups	3489.295	68	51.313		
Total	4366.969	72			

The results in Table 4.25 show that the mean differences in perception of ICT integration score against teaching subject were statistically significant at $F(4, 68) = 4.276$, $p=0.004$. As noted earlier, this finding implies that uptake of ICT integration in teaching and learning may be different in teachers teaching different subjects. Therefore education managers should design content specific strategies targeting increasing teachers who teach different subjects.

LSD post hoc multiple comparison tests (Appendix VIII) located significant differences between: science and mathematics in favour of science; science and languages in favour of science and science and humanities in favour of science. There were no significant differences between science and technical & and applied subjects; and all other subjects (mathematics, languages, humanities and technical & applied subjects). This finding implies that science teachers are likely to make more efforts towards integration of ICT in teaching and learning and this should be sustained and promoted further.

4.3.2.5 Influence of perception of ICT and level of ICT integration

The first research question sought to establish the influence of teachers' perceptions of ICT and the level of ICT integration in teaching and learning. Therefore, the ICT perception score was regressed against the ICT integration score to test the null hypothesis that ***"teacher perception of ICT is not a statistically significant predictor of ICT integration in teaching and learning"***. The results are presented in Table 4.26.

Table 4. 26: Relationship between perception of ICT score and ICT integration score

Model	Un-standardized Coefficients		Standardized Coefficients	t	Sig.	Adjusted R^2
	B	Std. Error	Beta			
(Constant)	4.007	12.009		0.334	0.740	0.069
Perception of ICT score	0.589	0.234	0.287	2.520	0.014	

a Dependent Variable: Use of ICT score

The results in table 4.26 show that perception of ICT score is a statistically significant predictor ICT integration score at t=2.520, p=0.014. The null hypothesis is rejected and in conclusion teachers' perception of ICT integration has a bearing of the extent of their integration of ICT in teaching and learning. The model fit R^2 =0.069 which implies that perception of ICT integration can contribute up to 6.9% of ICT integration in teaching and learning. Therefore, training interventions that focus on promoting ICT integration in teaching and learning should incorporate components that promote positive teacher perception of ICT integration.

4.3.3 Teachers' Competence in ICT and Integration of ICT in Teaching and Learning

The second research question sought to determine the influence of teachers' capacity development in ICT on level of ICT integration in the classroom. The teacher capacity development in ICT focused on teachers' competence in some specific ICT skills and was measured using 10 items that assessed teachers' ability to use ICT tools in: preparation of lesson plans, lesson notes and students' worksheets; analysis of students' scores; storage of students records; presentations during teaching; accessing educational materials and collaboration with other teachers in the social media. The 10 items were positive statements that respondents were required to rate using a 4-point rating scale of 1-4 as follows: highly competent (4); competent (3); lowly competent (2); and no competence (1). For each respondent, the responses were summed up to obtain an aggregated teacher competence-in-ICT-score which ranged from a minimum of 10 and a maximum of 40. This aggregated composite score was then expressed as a percentage and used for comparison across sub-groups. A high competence-in-ICT-score indicated that a teacher had high competence in ICT while a low score indicated that a teacher had low competence in ICT. In this study, the competence-in-ICT-score was categorized into three levels; high, satisfactory and low. Table 4.27 show the benchmarks and standards of interpretation of the three levels of competence-in-ICT-score that were set for this study.

Table 4. 27: Benchmarks and interpretation of Competence-in-ICT-score

Competence in ICT Score	Interpretation
75-100	High level of competence in ICT
50-74	Satisfactory level of competence in ICT
< 50	Low level of competence in ICT

The data that was obtained was used to compute the mean teachers' competence-in-ICT-score and the results are presented in table 4.28.

Table 4. 28: Mean Competence in ICT Score

Variable	N	Mean	SE	SD
Competence-in-ICT-Score	73	38.5	1.88	16.07

The results in table 4.28 show that the mean competence-in-ICT-score was 38.5%. Based on the set benchmarks and standard of interpretation for this study, respondents had low competence in ICT in teaching and learning. Consequently, the school management, education managers and policy makers should be made aware of this low competence of teachers in ICT it is likely to derail the government policy of full integration of ICT in education.

Further comparisons of teacher's competence-in-ICT-score were made against the four background information of gender, educational qualifications, teaching experience and teaching subject.

4.3.3.1 Competence in ICT and gender

The mean teachers' competence-in-ICT-score in teaching and learning by gender was computed and the results are presented in tables 4.29.

Table 4. 29: Mean Competence in ICT Score Against Gender

Gender	N	Mean	SE	SD
Male	37	42.4	2.47	15.03
Female	36	34.6	2.72	16.34
Total	73	38.5	1.88	16.07

The results in table 4.29 show that male respondents had higher mean competence-in-ICT-score compared female respondents. This finding implies that teachers' gender may be a factor that can influence competence in ICT.

The teachers' competence-in-ICT-score by gender was subjected to independent samples t-test to determine whether the observed mean differences between male and female teachers were statistically significant. The results are presented in table 4.30.

Table 4. 30: Independent Samples T-Test of Mean Competence-in-ICT-Score Against Gender

Gender	N	Mean	SD	SE	t	df	p
Male	37	40.6	15.17	2.49	3.980	71	0.000
Female	36	27.0	13.96	2.33			

The results in table 4.30 shows that the observed mean differences in competence-in-ICT-score between male and female teachers is statistically significant in favour of male teachers at t =3.980, df=71, p=0.000. Therefore education managers should explore why female teachers have a lower level of competence in ICT and institute remedial measures as it is likely to affect uptake of ICT integration in education. Likewise strategies for affirmative action should be formulated to promote competence in ICT in teaching and learning among female teachers.

4.3.3.2 Competence in ICT and Education Qualifications

The mean teachers' competence-in-ICT-score in teaching and learning against education qualification was computed and the results are presented in Tables 4.31.

Table 4. 31: Mean Teacher Competence-in-ICT-Score Against Education Qualifications

Education qualifications	N	Mean	SE	SD
Masters' degree	19	43.6	4.63	20.20
B.Ed & BSc + PGDE	50	37.5	1.71	12 12
Diploma in education	4	27.5	15.88	31.75
Total	73	38.5	1.88	16.07

The results in table 4.31 show that there are differences in mean teacher competence-in-ICT-score based on education qualification. The results further show that the mean competence-in-ICT-score increases with higher education qualifications. This finding may imply that opportunities for higher education are accompanied with more exposure to ICT content.

One Way ANOVA was conducted on the mean competence-in-ICT-score against the education qualifications to determine whether the observed mean differences were statistically significant The results are presented in table 4.32.

Table 4. 32: One Way ANOVA of Mean Competence-in-ICT-Score Against Education Qualifications

	Sum of Squares	df	Mean Square	F	P
Between Groups	1352.882	2	676.441	2.765	0.070
Within Groups	17123.759	70	244.625		
Total	18476.641	72			

The results in table 4.32 show that the mean differences in competence-in-ICT-score were not statistically significant at F (2, 70) =2.765, p=0.07.

4.3.3.3 Competence in ICT and teaching experience

The mean teachers' competence-in-ICT-score against teaching experience was computed and the results are presented in table 4.33.

Table 4. 33: Mean Competence-in-ICT-Score Against Teaching Experience

Teaching experience in years	N	Mean	SE	SD
>24	4	45.6	1.88	3.75
15-24	39	34.4	2.66	16.60
10-14	14	40.2	4.47	16.71
<14	16	45.5	3.39	13.55
Total	73	38.5	1.88	16.07

The results in table 4.33 show that there are differences in mean competence-in-ICT-score based on teaching experience. A trend is observed where the mean competence-in-ICT-score declines with increasing teaching experience. This finding may imply that younger teachers have higher competence in ICT than older teachers.

One Way ANOVA was conducted on the mean competence-in-ICT-score against the teaching experience to determine whether the observed mean differences were statistically significant. The results are presented in table 4.34.

Table 4. 34: One Way ANOVA of Mean Competence-in-ICT-Score Against Teaching Experience

	Sum of Squares	df	Mean Square	F	P
Between Groups	1548.477	3	516.159	2.104	0.108
Within Groups	16928.164	69	245.336		
Total	18476.641	72			

The results in table 4.34 show that the mean differences in competence-in-ICT-score were not statistically significant at F (3, 69) =2.104, p=0.108. This finding implies that although mean differences in the competence in ICT skills were observed, teaching experience may not have a bearing on the level of teacher competence in ICT.

4.3.3.4 Competence in ICT and Teaching Subject

The mean teachers' competence-in-ICT-score against teaching subject was computed and the results are presented in table 4.35.

Table 4. 35: Competence-in-ICT-Score and Teaching Subject

Teaching subject	N	Mean	SE	SD
Mathematics	10	46.3	1.55	4.89
Languages	19	33.8	3.23	14.08
Science	15	44.2	4.56	17.67
Humanities	19	35.0	3.08	13.44
Technical & Applied	10	38.0	7.78	24.60
Total	73	38.5	1.88	16.07

The results in table 4.35 show that there are differences in mean competence-in-ICT-score by teaching subject. Teachers of mathematics had the highest score followed by teachers of science while the languages had the lowest score.

One Way ANOVA was conducted on competence-in-ICT-score against the teaching subject to determine whether the observed mean differences were statistically significant. The results are presented in Table 4.36.

Table 4. 36: One Way ANOVA of Mean Competence-in-ICT-Score Against Teaching Subject

	Sum of Squares	Df	Mean Square	F	P
Between Groups	1734.382	4	433.595	1.750	0.149
Within Groups	16851.064	68	247.810		
Total	18585.445	72			

The results in Table 4.36 show that the mean differences in competence-in-ICT-score against teaching subject were not statistically significant at $F(4, 68) = 1.750$, $p=0.149$.

4.3.3.5 Influence of Competence in ICT on level of ICT integration

The second research question sought to establish the influence of teachers' competence in ICT and the level of ICT integration in teaching and learning. Therefore, the competence-in-ICT-score was regressed against the ICT-integration-score to test the null hypothesis that ***"teacher competence in ICT is not a statistically significant predictor of ICT integration in teaching and learning"***. The results are presented in Table 4.37.

Table 4. 37: Relationship between Competence-in-ICT-Score and ICT-Integration-Score

Model	Un-standardized Coefficients		Standardized Coefficients	t	Sig.	Adjusted R^2
	B	Std. Error	Beta			
(Constant)	2.179	2.778		0.784	0.435	0.679
Competence-in-ICT-score	0.824	0.067	0.827	12.372	0.000	

a Dependent Variable: ICT competence in score

The results in table 4.37 show that competence-in-ICT-score is a statistically significant predictor ICT-integration-score at t=12.372, p=0.000. The null hypothesis is rejected and in conclusion teachers' competence in ICT has a great influence on the level of ICT integration in teaching and learning. The model fit R^2 =0.679 which implies that competence in ICT can contribute up to 67.9% of ICT integration in teaching and learning. Therefore, training interventions that focus on promoting ICT integration in teaching and learning should also incorporate components that promote basic competence in use of ICT tools as they form the foundation for ICT integration in teaching and learning.

4.3.4 Teachers' Workload and Level of ICT Integration in Teaching and Learning

The third research question sought to establish the influence of teachers' teaching workload on level of ICT integration in teaching and learning. Respondents were required to indicate their workload (number of lessons taught per week). The data that was obtained was used to compute frequencies and percentages. The results are presented in Tables 4.38.

Table 4. 38: Workload (Number of Lessons Taught Per Week)

Number of lessons taught per week	Frequency	Percentage
17	3	4.1
19	3	4.1
20	11	15.1
21	1	1.4
22	6	8.2
23	5	6.8
24	15	20.5
25	9	12.3

26	4	5.5
27	4	5.5
28	9	12.3
29	2	2.7
30	1	1.4
Total	**73**	**100.0**

The results in Table 4.38 shows that the number of lessons taught per week ranged from 17 to 30. Since each lesson takes 40 minutes, the number of hours of teaching ranged from 11.3 hours per week or 2.3 hours of teaching per day to 20 hours per week or 4 hours per day.

Further comparisons of teacher's workload were made against the four background information of gender, educational qualifications, teaching experience and teaching subject.

4.3.4.1 Teachers' Workload and Gender

The mean teachers' workload by gender was computed and the results are presented in table 4.39.

Table 4. 39: Mean Teacher Workload Against Gender

Gender	N	Mean	SE	SD
Male	37	23.0	0.59	3.58
Female	36	24.5	0.42	2.50
Total	73	23.7	0.37	3.17

The results in table 4.39 show that female respondents had a higher workload compared to male respondents. This higher workload for female teachers may be one of the factors that derail their effort towards ICT integration in teaching and learning.

The teachers' workload by gender was subjected to independent samples t-test to determine whether the observed mean differences between male and female teachers were statistically significant. The results are presented in table 4.40.

Table 4. 40: Independent Samples T-Test of Mean Workload Against Gender

Gender	N	Mean	SD	SE	t	df	P
Male	37	23.0	3.58	0.59	-2.069	71	0.042
Female	36	24.5	2.50	0.42			

The results in table 4.40 shows that the observed mean differences in workload between male and female teachers is statistically significant in favour of male teachers at t = -2.069, df=71, p=0.042. This is a further confirmation that the workload of female teachers may be one of the contributory factors to their lower uptake of ICT integration in teaching and learning.

4.3.4.2 Teachers' Workload and Education Qualifications

The mean teachers' workload against education qualification was computed and the results are presented in Tables 4.41.

Table 4. 41: Mean Teacher Workload Against Education Qualifications

Education qualifications	N	Mean	SE	SD
Masters' degree	19	24.2	0.80	3.49
B.Ed & BSc + PGDE	50	23.3	0.42	3.05
Diploma in education	4	27.0	0.58	1.16
Total	73	23.7	0.37	3.17

The results in table 4.41 show that there are differences in mean teacher workload based on education qualification. Teachers with Diploma in Education qualification had the highest workload.

One Way ANOVA was conducted on the mean teacher workload against the education qualifications to determine whether the observed mean differences were statistically significant. The results are presented in table 4.42.

Table 4. 42: One Way ANOVA of Mean Teacher Workload against Education Qualifications

	Sum of Squares	df	Mean Square	F	P
Between Groups	56.397	2	28.198	2.965	0.05
Within Groups	665.658	70	9.509		
Total	722.055	72			

The results in table 4.42 show that the mean differences in teacher workload against education qualifications statistically significant at F (2, 70) =2.965, p=0.05. Therefore education managers should establish the appropriate teachers' workload threshold that cannot hamper integration of ICT in teaching and learning.

4.3.4.3 Teachers' Workload and Teaching Experience

The mean teachers' workload against teaching experience was computed and the results are presented in table 4.43.

Table 4. 43: Mean Teachers' Workload Against Teaching Experience

Teaching experience in years	N	Mean	SE	SD
>24	4	21.6	1.75	3.50
15-24	39	23.4	0.57	3.55
10-14	14	24.5	0.75	2.82
<14	16	24.3	0.55	2.18
Total	73	23.7	0.37	3.17

The results in table 4.43 show that there are differences in mean teacher workload against teaching experience. A trend is observed where the mean teacher workload declines with increasing teaching experience.

One Way ANOVA was conducted on the mean teacher workload against the teaching experience to determine whether the observed mean differences were statistically significant. The results are presented in table 4.44.

Table 4. 44: One Way ANOVA of Mean Teacher Workload Against Teaching Experience

	Sum of Squares	df	Mean Square	F	P
Between Groups	32.778	3	10.926	1.094	0.358
Within Groups	689.277	69	9.990		
Total	722.055	72			

The results in table 4.44 show that the mean differences in teacher workload were not statistically significant at F (3, 69) =1.094, p=0.358.

4.3.4.4 Teachers' Workload and Teaching Subject

The mean teachers' workload against teaching subject was computed and the results are presented in table 4.45.

Table 4. 45: Teachers' Workload and Teaching Subject

Teaching subject	N	Mean	SE	SD
Mathematics	10	23.7	0.98	3.09
Languages	19	22.5	0.73	3.20
Science	15	25.7	0.47	1.83
Humanities	19	22.4	0.67	2.93
Technical & Applied	10	25.8	0.95	3.01
Total	73	23.7	0.37	3.17

The results in table 4,45 show that there are differences in mean teachers' workload by teaching subject. Teachers of science and technical & applied subjects had the highest workload while teachers of humanities had the lowest workload.

One Way ANOVA was conducted on teachers' workload against the teaching subject to determine whether the observed mean differences were statistically significant. The results are presented in Table 4.46.

4.3.5 School Management Support and ICT Integration and Level of ICT Integration in Teaching and Learning

The fourth research question sought to determine the influence school management support and level of ICT integration in teaching and learning. School management and support was measured with eight (8) items that focused on: management encouragement of use of ICT tools in teaching and learning; technical support on ICT tools; encouragement of teachers to participate in learning opportunities in ICT; provision of ICT equipment, materials and infrastructure. The 8 items were positive statements that respondents were required to rate using a 4-point rating scale of 1-4 as follows: strongly agree (4); agree (3); disagree (2) and strongly disagree (1). For each respondent, the responses were summed up to obtain an aggregated school management support score which ranged from a minimum of 8 and a maximum of 32. This aggregated composite score was then expressed as a percentage and used for comparison across sub-groups. A high school management support score indicated that a teacher experience high support while a low score indicated that a teacher experience low school management support in ICT integration. In this study, the school management support score was categorized into three levels; high, satisfactory and low. Table 4.48 show the benchmarks and standards of interpretation of the three levels of school-management support-score that were set for this study.

Table 4. 48: Benchmarks and interpretation of School Management Support Score

School Management Support Score	Interpretation
75-100	High level of school management support
50-74	Satisfactory level of school management support
< 50	Low level of school management support

The data that was obtained was used to compute the mean school management support score and the results are presented in table 4.49.

Table 4. 49: Mean School Management Support Score

Variable	N	Mean	SE	SD
School Management Support Score	73	52.6	1.63	13.89

The results in table 4.49 show that the mean School Management Support Score was 52.6%. Based on the set benchmarks and standard of interpretation for this study, respondents expressed satisfactory level of support by school management on ICT integration in teaching and learning. However, this level of support based on the mean score is still very low. Consequently, the school management, education managers and policy makers should be made aware of this low school management support for ICT integration efforts as it is likely to derail the government policy of full integration of ICT in education.

Further comparisons of the School Management Support Score were made against the four background information of gender, educational qualifications, teaching experience and teaching subject.

4.3.5.1 School Management Support and Gender

The mean school management support by gender was computed and the results are presented in table 4.50.

Table 4. 50: Mean School Management Support Against Gender

Gender	N	Mean	SE	SD
Male	37	53.9	1.96	11.93
Female	36	51.2	2.62	15.69
Total	73	52.6	1.63	13.88

The results in table 4.50 show that male respondents had higher school management support scores that female respondents.

The school management support score was subjected to independent samples t-test to determine whether the observed mean differences between male and female teachers were statistically significant. The results are presented in table 4.51.

Table 4. 51: Independent Samples T-Test of Mean School Management Support Score Against Gender

Gender	N	Mean	SD	SE	t	df	P
Male	37	53.9	11.93	1.96	0.820	71	0.415
Female	36	51.2	15.69	2.62			

The results in table 4.51 shows that the observed mean differences in school management support between male and female teachers is not statistically significant at t = 0.820, df=71, p=0.415.

4.3.5.2 School Management Support and Education Qualifications

The mean school management support score against education qualification was computed and the results are presented in Tables 4.52.

Table 4. 52: Mean School Management Support Against Education Qualifications

Education qualifications	N	Mean	SE	SD
Masters' degree	19	51.6	4.72	20.55
B.Ed & BSc + PGDE	50	53.1	1.59	11.22
Diploma in education	4	50.0	1.80	3.61
Total	73	52.6	1.63	13.88

The results in table 4.52 show that there are differences in mean school management support based on education qualification. Teachers with Diploma in Education qualification had the lowest support score.

One Way ANOVA was conducted on the mean school management support score against the education qualifications to determine whether the observed mean differences were statistically significant. The results are presented in table 4.53.

Table 4. 53: One Way ANOVA of Mean School Management Support Against Education Qualifications

	Sum of Squares	df	Mean Square	F	P
Between Groups	58.087	2	29.043	.147	.863
Within Groups	13815.789	70	197.368		
Total	13873.876	72			

The results in table 4.53 show that the mean differences in school management support against education qualifications was not statistically significant at F (2, 70) =0.147, p=0.863.

4.3.5.3 School Management Support and Teaching Experience

The mean school management support score against teaching experience was computed and the results are presented in table 4.54.

Table 4. 54: Mean School Management Support Score Against Teaching Experience

Teaching experience in years	N	Mean	SE	SD
>24	4	47.7	0.78	1.56
15-24	39	53.2	1.78	11.12
10-14	14	50.4	5.88	21.99
<14	16	54.1	3.34	13.34
Total	73	52.6	1.63	13.88

The results in table 4.54 show that there are differences in mean school management support score against teaching experience. Generally teachers with less teaching experience perceived more support than those with longer teaching experience.

One Way ANOVA was conducted on the mean school management support score against the teaching experience to determine whether the observed mean differences were statistically significant. The results are presented in table 4.55.

Table 4. 55: One Way ANOVA of Mean School Support Against Teaching Experience

	Sum of Squares	df	Mean Square	F	P
Between Groups	212.976	3	70.992	0.359	0.783
Within Groups	13660.900	69	197.984		
Total	13873.876	72			

The results in table 4.55 show that the mean differences in school management support score was not statistically significant at $F(3, 69) = 0.359$, $p = 0.783$.

4.3.5.4 School Management Support and Teaching Subject

The mean school management support score against teaching subject was computed and the results are presented in table 4.56.

Table 4. 56: School Management Support Score and Teaching Subject

Teaching subject	N	Mean	SE	SD
Mathematics	10	51.3	3.90	12.34
Languages	19	48.4	4.27	18.62
Science	15	55.2	2.87	11.12
Humanities	19	51.2	2.10	9.15
Technical & Applied	10	60.6	4.57	14.45
Total	73	52.6	1.63	13.88

The results in table 4.56 show that there are differences in mean school management support score by teaching subject. Teachers of technical & applied subjects perceived more support while teachers of languages perceived the least support.

One Way ANOVA was conducted on school management support score against the teaching subject to determine whether the observed mean differences were statistically significant. The results are presented in Table 4.57.

Table 4. 57: One Way ANOVA of Mean School Management Support Against Teaching Subject

	Sum of Squares	df	Mean Square	F	P
Between Groups	1146.423	4	286.606	1.531	0.203
Within Groups	12727.453	68	187.168		
Total	13873.876	72			

The results in Table 4.57 show that the mean differences in school management support score against teaching subject were not statistically significant at $F(4, 68) = 1.531$, $p=0.203$.

4.3.5.5 Influence of School Management Support on ICT Integration

The fourth research question sought to establish the influence of school management support on the level of ICT integration in teaching and learning. Therefore, school management support score was regressed against the ICT-integration-score to test the null

hypothesis that ***"school management support is not a statistically significant predictor of ICT integration in teaching and learning"***. The results are presented in Table 4.58.

Table 4. 58: Relationship between School Management Support Score and ICT-Integration-Score

Model	Un-standardized Coefficients		Standardized Coefficients	t	Sig.	Adjusted R^2
	B	Std. Error	Beta			
(Constant)	12.292	6.954		1.768	0.081	0.115
Teacher Workload	0.412	0.128	0.357	3.217	0.002	

a Dependent Variable: ICT Integration score

The results in table 4.58 show that school management support is a statistically significant predictor of ICT-integration-score at t= 3.217, p=0.002. The null hypothesis is rejected and in conclusion school management support has influence on the level of ICT integration in teaching and learning. The model fit was moderate at R^2 =0.115 which implies that school management support can only contribute up to 11.5% of ICT integration in teaching and learning.

4.3.5.6. Analysis from students' questionnaires and principals interview

From interviews of the principals, they felt integration was low and the reasons given for this were the attitude of teachers towards ICT integration, lack of skills, and one of the principals felt workload was a factor which made teachers not be able to plan for ICT integration in their lessons.

Students, on the question on the subjects where ICT tools were used indicated that the subjects were Mathematics, Sciences and computer science while few gave some humanities namely geography and history. On how they used computers, students gave use of internet for research, playing games and doing homework. This is an indication that there is some ICT use in these schools though the extent is low.

CHAPTER FIVE

SUMMARY OF FINDINGS, DISCUSSIONS,CONCLUSIONS AND RECOMMENDATIONS

5.1. Introduction

This chapter gives a summary of findings and conclusions and recommendations. It is divided into three sections. Section 5.2 gives a summary made from the study , section 5.3 gives a discussion of findings, section 5.4 gives the conclusion from the study, section 5.5 gives some recommendations and section 5.6 gives suggestions for further research.

5.2. Summary of findings

This study sought to determine the influence of four factors (independent variables) on integration of ICT in teaching and learning in secondary schools. These factors were: teachers' perception of ICT integration; level of teachers' capacity development in use of ICT tools; workload and management support for teachers' use of ICT. The dependent variable was level of teachers' use of ICT in teaching their subjects.

The mean ICT integration score was found to be 34.0% and based on the set benchmarks and standards of interpretation in this study, the level of ICT integration in teaching and learning was low. The research also showed that male respondents had a higher level of ICT integration in teaching and learning compared to female respondents at t=3.980,p=0.0001.

Mean perception of ICT integration score was 50.8%. Based on the set benchmarks and standard of interpretation for this study, respondents had a satisfactory perception of ICT integration in teaching and learning though tending towards low. This perception differed based on gender, teaching experience, education qualification and even subjects taught. The results from the study indicated that perception of ICT score is a statistically significant predictor of ICT integration score at t=2.520, p=0.014. The model fit R^2 =0.069 obtained implies that perception of ICT integration can contribute up to 6.9% of ICT integration in teaching and learning.

Mean competence-in-ICT-score was 38.5% and based on the set benchmarks and standard of interpretation for this study, respondents had low competence in ICT in teaching and learning. Teaching experience had no bearing on competency. Competence-

in-ICT-score is a statistically significant predictor of ICT-integration-score at t=12.372, p=0.000. The model fit R^2 =0.679 implies that competence in ICT can contribute up to 67.9% of ICT integration in teaching and learning.

Study also showed teacher workload is not a statistically significant predictor of ICT-integration-score at t= -1.155, p=0.252. The model fit is very weak at R^2 =0.005 79 which implies that teacher workload can only contribute up to 0.5% of ICT integration in teaching and learning.

Lastly, mean School Management Support Score was 52.6%. Based on the set benchmarks and standard of interpretation for this study, respondents expressed satisfactory level of support by school management on ICT integration in teaching and learning. The study further showed that school management support is a statistically significant predictor of ICT-integration-score at t= 3.217, p=0.002. The null hypothesis is rejected and in conclusion school management support has influence on the level of ICT integration in teaching and learning. The model fit was moderate at R^2 =0.115 which implies that school management support can only contribute up to 11.5% of ICT integration in teaching and learning.

5.3. **Discussion of findings**

The research found that generally, the level of ICT integration in teaching and learning was low. From the findings, female teachers have a lower level of ICT integration than the male teachers.Therefore education managers should explore why female teachers have a lower level of ICT integration in teaching and learning as this is likely to affect uptake of ICT integration in education. Likewise strategies should be formulated to encourage uptake of ICT tools in teaching and learning by female teachers. There is no significant difference in level of ICT integration based on teaching experience and education qualification.

The findings indicated that the teaching subject has a bearing on the level of ICT integration in teaching and learning. Therefore, education managers should design content specific interventions that promote ICT integration in teaching and learning to address the specific needs of teachers in different subjects rather than being general in nature.

From the research findings, teachers' perception of ICT integration has a bearing on the extent of their integration of ICT in teaching and learning. Perception of ICT integration can contribute up to 6.9% of ICT integration in teaching and learning. According to Carlson and Gadio (2002), teachers are the key to whether technology is used appropriately and effectively.Therefore, training interventions that focus on promoting ICT integration in teaching and learning should incorporate components that promote positive teacher perception of ICT integration. This perception also tends to vary among teachers teaching different subjects with science and mathematics teachers having highest positive perception maybe due to higher competency skills as observed in the study.

The research indicated that teachers have low competence in ICT in teaching and learning. Competence in ICT was found to be statistically significant predictor of ICT integration in teaching and learning. Tella, et al.(2007) found lack of skills in the use of ICT equipment and software had resulted in a lack of confidence in utilising ICT tools. This is consistent with Preston (2000) who concluded that lack of technical support to be key inhibitor to the use of ICT in classroom. Consequently, the school management, education managers and policy makers should be made aware of this low competence of teachers in ICT as it is likely to derail the government policy of full integration of ICT in education.

BECTA (2004b) identified lack of time for preparation of computer based lessons as one of the barriers to ICT integration and also according to research carried out in Malaysian Smart schools (2010),many teachers felt time was an important factor in ICT integration but this study showed the present teacher workload in Kikuyu constituency is not a statistically significant predictor of ICT-integration-score. This observation was not based on the teachers' perception but on actual workload of teachers.

The school leadership provides the direction and support in terms of school policy that outlines goals and also the necessary resources for the teachers. "Successful change and ICT implementation in schools depends on effective leadership" (Stuart et al 2009). According to a research carried out in Kabale, Uganda in 2011 (Twinomujuni J.A., 2011),administration support is essential for ICT integration in schools.Yang (2008) concurs that lack of technical support was one of the major barriers that resulted in 'computers being underutilized in the classes. From this study respondents expressed

satisfactory level of support by school management on ICT integration in teaching and learning. However, this level of support based on the mean score was low. School management support was found to have an influence on the level of ICT integration in teaching and learning. The model fit was moderate at R^2 =0.115 which implies that school management support can contribute up to 11.5% of ICT integration in teaching and learning. Consequently, the school management, education managers and policy makers should be sensitized on the need to offer support to teachers in order to enhance ICT integration.

From this research therefore, the factors found to affect ICT integration are teachers' perception, competency in use of ICT tools, and support by management. These agree with other research studies carried out in other regions. The prevailing teachers' workload in Kenya does not seem to have a bearing on ICT integration in teaching and learning.

5.4. Conclusion

The results from the data presented showed that in spite of the government visions and polices for the use and integration of ICT in schools, three very important features of integration are lacking. Teachers' perception of ICT integration was found to have significant bearing on the extent of their integration of ICT in teaching and learning. Human resource development in terms of skilled teachers to use ICT in teaching and learning processes was another factor that significantly influences integration of ICT in teaching and learning. And lastly, school management support was found to significantly influence the level of ICT integration in teaching and learning.

5.5. Recommendations

ICT is an influential instrument for the development of quality teaching and learning in educational systems around the world, as well as a means for fundamental transformation into the existing school principles and practices for the preparation of students in meeting the innovations in the global arena. In view of the findings, the following are the recommendations:

i. That training interventions for teachers be organized in the use of ICT tools in teaching and learning. These training interventions should focus on promoting ICT integration in teaching and learning and should incorporate components that promote basic competence in use of ICT tools as they form the foundation for ICT integration in teaching and learning. Such trainings should be subject

specific and have a component that would assist in changing the low perception of teachers on ICT integration.

ii. Curriculum for the training should be subject based so that teachers learn how to integrate in the various subjects.

iii. There should also be more sensitization of education managers on the need to support teachers in ICT integration.

5.6. Suggestions for further research

This research endeavor might have made a considerable stride in the understanding some of the factors influencing ICT integration in teaching and learning. The following are suggested areas for further research :

i. Further probe some of the findings that have emerged in this study for example why there is variation in level of ICT integration in the subjects. The study indicated, though not conclusively, that there is a difference in level of integration in the specific subjects. There is therefore need for more research to look at barriers to ICT integration that exist in specific subjects.

ii. ICTs usage in other schools other than the ones under ESP programme.

iii. It is equally important to observe ICT integration in the classroom to confirm the type of integration taking place in schools .

iv. Carry out similar research in other constituencies.

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APPENDICES

Appendix 1

Letter of Transmittal

Mary Kariuki

Box 28098-00100 Nairobi

Tel. 0722398912

15/09/2012

To principal,

----------school,

Re: Academic Research

Am a student at the University of Nairobi. I am conducting a research on "**Factors influencing integration of ICT in teaching and learning in secondary schools**". The research is in partial fulfilment of the requirements for the award of Masters of Arts Degree in Project Planning and Management of the University of Nairobi.

Teachers, principals and form 11 students will be used as respondents.

I assure you that the responses will be treated with outmost confidentiality and will not be used for any other purposes other than the intended research work.

I thank you for your support and cooperation.

Yours Faithfully,

Kariuki Mary Wairimu

Appendix 11

REPUBLIC OF KENYA

NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY

Telephone [illegible] 2241349
254-020-310571, 2213123, 2219420
Fax 254-020 318245, 318249
When replying please quote
secretary@nost.go.ke

P.O. Box 30623-00100
NAIROBI KENYA
Website www.nost.go.ke

Our Ref: NCST/RCD/13/012/52

Date: 9th August 2012

Mary Wairimu Karuki
University of Nairobi
P O Box 30197-00100
Nairobi

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on "*Factors influencing the integration of ICT in teaching and learning in secondary schools: A case of Kikuyu District, Kenya*," I am pleased to inform you that you have been authorized to undertake research in Kikuyu District for a period ending 30th **September, *2012*.**

You are advised to report to the District Commissioner and the District Education Officer, Kikuyu District before embarking on the research project.

On completion of the research, you are expected to submit two hard copies and one soft copy in pdf of the research report thesis to our office.

DR. M. K. RUGUTT, PhD, HSC.
DEPUTY COUNCIL SECRETARY

Copy to:

The District Commissioner
The District Education Officer
Kikuyu District

Appendix 111

TEACHERS' QUESTIONNAIRE

INTRODUCTION

This questionnaire is designed to gather data about factors affecting ICT integration in teaching and learning in Kiambu County of Central Province, Kenya. The information provided will be treated with confidentiality and is only meant for this research. The questionnaire is divided into five sections: **A, B, C, D** and **E.** Section **A** focus on factual information about your background and require you to tick the relevant choice. Sections **B** to **E** seek your opinions, perceptions and facts based on your experience and you are kindly requested to respond as honestly as possible.

SECTION A: BACKGROUND INFORMATION

1. Sex Male ☐ Female ☐

2. What is your highest educational qualification?

   PhD ☐

   Master Degree ☐

   B.Ed /BSC + PGDE ☐

   Diploma in Education ☐

   Others ☐ please specify.

   [.....]

3. What is your teaching experience?

   More than 24 years ☐

   15-24 years ☐

   10-14 years ☐

   Less than 10 years ☐

4. What are your teaching subjects?

a. Subject 1 [.....]

b. Subject 2 [.....]

c. Subject 3: [.....]

5. How many lessons do you teach per week? [.....]

SECTION B: TEACHERS' PERCEPTION ON ICT INTEGRATION

Read each statement carefully and rate by ticking (√) in the table below, your level of agreement or disagreement with the statement. Use the key provided.

Key: **4**-Strongly agree **3**-Agree **2**-Disagree **1**- Strongly disagree

No	Statement	Rating			
		4	3	2	1
6	ICT tools are difficult to use				
7	I feel comfortable working with ICT tools like a computer				
8	I believe that I could be a better teacher with ICT tools				
9	I see the ICT tools as something I will rarely use in my teaching				
10	Use of ICT tools in teaching can improve students performance				
11	I think that using ICT tools for teaching would be enjoyable and stimulating				
12	ICT tools are not relevant in teaching				
13	I always try out some learning activities with ICT tools				
14	I encourage my pupils to use ICT tools				

15	I consider use of ICT tools as useful for learning				
16	I do not feel threatened with the use of ICT tools				
17	I plan for use of ICT tools in my lessons				
18	Use of ICT tools is critical for improvement of learning achievement				
19	I make efforts to upgrade my skills in use of ICT skills				
20	I encourage my students to search for information on the Internet				
21	Use of ICT tools in class is very frustrating				
22	I am incapable of operating ICT tools independently				
23	I feel inadequate in using ICT tools in class				

SECTION C: TEACHERS' CAPACITY DEVELOPMENT IN USE OF ICT TOOLS

Read each statement carefully and rate by ticking (√) in the table below, your level of competency in each of the ICT skill areas. Use the key provided.

Key: **4-** highly competent **3-** competent **2-**lowly competent **1-** no competence

No	Statement	Rating			
		4	3	2	1
24	Use of word processing in preparation of lessons and worksheets				
25	Use of spreadsheets in analysis of students marks				
26	Use of databases in storage of students records				
27	Use of PowerPoint presentations for classroom instructions				
28	Use of ICT in the classroom for instructional purposes				
29	Use internet to access teaching and learning resources				
30	How to operate and maintain computers				
31	Assist students to access learning materials				
32	Assess students learning				
33	Collaborate with other teachers e.g. through use of blogs				

SECTION D: USE OF ICT IN TEACHING SUBJECTS

Read each statement carefully and rate by ticking (√) in the table below, your extent of use of ICT in your lessons. Use the key provided.

Key: **4**- very frequently **3**- frequently **2**-rarely **1**-never

No	Statement	Rating			
		4	3	2	1
34	I use word processing in preparation of lesson plans				
35	I use ICT in preparing lesson notes				
36	I use word processing in preparation of students' worksheets				
37	I use spreadsheets in analysis of students marks				
38	I use databases in storage of students records				
39	I use PowerPoint presentations for classroom instructions				
40	I use ICT tools to support teaching my subject				
41	I use ICT for monitoring students' progress and evaluating learning outcomes				
42	I use the internet to find and access educational materials				
43	I use ICT for collaboration with other teachers				
44	I use ICT for preparing reports				
45	I prepare lessons that involve the use of ICT by learners				
46	I use ICT for keeping track of students performance				

SECTION E: MANAGEMENT SUPPORT FOR TEACHERS IN ICT

Management support refers to any support provided by principal, deputy principal and heads of department.

Read each statement carefully and rate by ticking (√) in the table below, your level of agreement or disagreement with the statements. Use the key provided.

Key: **4**- Strongly agree, **3**- Agree **2**-Disagree **1**- Strongly disagree

No	Statement	Rating			
		4	3	2	1
47	In this school, use of ICT tools in teaching and learning is encouraged by management				
48	In this school, I get technical support from management while using ICT tools				
49	My school management has put support strategies for teachers to use ICT tools in teaching and learning				
50	In this school, management encourages teachers to participate in learning opportunities in ICT				
51	In this school, management supports teachers to participate in learning opportunities in ICT				
52	In this school, ICT materials are provided for use in the classroom				
53	In this school, ICT equipment and materials are accessible when I need to use them in my lessons				
54	The school's ICT equipment and materials are supplied and are adequate for classroom use				

Thank you for the time that you have devoted to complete this questionnaire

Appendix 1v

Principals' interview schedule

PRINCIPALS' INTERVIEW SCHEDULE

This questionnaire is designed to gather data about factors affecting ICT integration in teaching and learning in Kiambu County of central province, Kenya.

The information provided will be treated with confidentiality and is only meant for this research.

PART A

Background Information

1. Sex

   Male ☐ Female ☐

2. What is your highest professional qualification?

   Masters' degree ☐ Bachelors' degree ☐ Dip Ed ☐

   Other specify----------

3. For how long have you been in the teaching profession?

   More than 24 years ☐ 15-24 years ☐ 10-14 years ☐ 5-9 years ☐ less than 5 years ☐

PART B

4. How would you rate the level of ICT integration by teachers in your school?

5. What do you consider as barriers to ICT integration in the classroom in your school?

---

6. What support do you provide the teachers in your school in order to integrate ICT in the classroom?

---

7. Averagely, what is the level of expertise of the teachers in your school?

8. Do teachers plan for the use of ICTs in their schemes of work?

9. Has there been any ICT training for teachers within the last three years?

10. What skills do you think teachers should have in order to integrate ICT in teaching and learning?

Thank you for your time.

STUDENTS' QUESTIONNAIRE

This questionnaire is designed to gather data about factors affecting ICT integration in teaching and learning in Kiambu County. The information provided will be treated with confidentiality and is only meant for this research.

PART A Background information

Please put a tick (√) against the correct response or fill in the information as your response to the following background Information.

1. Please indicate your Sex

   Male ☐ Female ☐

2. Your class

   Form 2 ☐ Form 3 ☐

3. What is your age bracket?

   Below 14 years ☐

   15years ☐

   16 years ☐

   17 years ☐

   Above 17 years ☐

PART B : Expertise in computer use

4. How would you rate your level of expertise in computer use?

Tick the one that applies	Level of expertise
	No expertise- cannot use computers at all
	Fair –able to operate basic computer functions and a word processing application
	Good
	Very good
	Excellent

SECTION C: Use of ICT in class by teachers

5. In which of the following subject(s) has the teacher used computers in the last one week?

Subject	**Computer used in class**
English	
Any foreign language	
Kiswahili	
Mathematics	
Science	
Computer Studies	
History	
Geography	
Agriculture	
Religious Education	
Home science	
Physical Education	

SECTION D: Uses of computers by students

6. Please indicate using a tick (√) the various ways you use computers in school.

In school I used computers to-----	Sometimes	Never
browse for information on internet		
play games		
send email to other people		
do my homework		
download music		
Write reports on project work		

Thank you for your time.

Appendix V

LSD Post Hoc Multiple Comparison Test of ICT score Against Subject

(I) Teaching subject	(J) Teaching subject	Mean Difference (I-J)	Std. Error	Sig.
Math	Languages	8.994	5.9995	.138
	Science	-.128	6.2692	.984
	Humanities	14.147(*)	5.9995	.021
	Tech & Applied	2.880	6.8676	.676
Languages	Mathematics	-8.994	5.9995	.138
	Science	-9.122	5.3040	.090
	Humanities	5.154	4.9823	.305
	Tech & Applied	-6.114	5.9995	.312
Science	Mathematics	.128	6.2692	.984
	Language	9.122	5.3040	.090
	Humanities	14.275(*)	5.3040	.009
	Tech & Applied	3.008	6.2692	.633
Humanities	Mathematics	-14.147(*)	5.9995	.021
	Languages	-5.154	4.9823	.305
	Science	-14.275(*)	5.3040	.009
	Tech & Applied	-11.267	5.9995	.065
Tech & Applied	Mathematics	-2.880	6.8676	.676
	Languages	6.114	5.9995	.312
	Science	-3.008	6.2692	.633
	Humanities	11.267	5.9995	.065

* *The mean difference is significant at the .05 level.*

Appendix VI

LSD Post Hoc Multiple Comparison Test of Perception of ICT Integration score Against Subject

(I) Teaching subject	(J) Teaching subject	Mean Difference (I-J)	Std. Error	Sig.
Math	Languages	-2.912	2.7986	.302
	Science	-9.823(*)	2.9244	.001
	Humanities	-1.010	2.7986	.719
	Tech & Applied	-5.421	3.2035	.095
Languages	Mathematics	2.912	2.7986	.302
	Science	-6.911(*)	2.4742	.007
	Humanities	1.902	2.3241	.416
	Tech & Applied	-2.509	2.7986	.373
Science	Mathematics	9.823(*)	2.9244	.001
	Language	6.911(*)	2.4742	.007
	Humanities	8.813(*)	2.4742	.001
	Tech & Applied	4.402	2.9244	.137
Humanities	Mathematics	1.010	2.7986	.719
	Languages	-1.902	2.3241	.416
	Science	-8.813(*)	2.4742	.001
	Tech & Applied	-4.411	2.7986	.120
Tech & Applied	Mathematics	5.421	3.2035	.095
	Languages	2.509	2.7986	.373
	Science	-4.402	2.9244	.137
	Humanities	4.411	2.7986	.120

* *The mean difference is significant at the .05 level.*