FACTORS AFFECTING INFORMATION COMMUNICATION TECHNOLOGY INTEGRATION IN TEACHING AND LEARNING IN PUBLIC SECONDARY SCHOOLS IN MUTITO CONSTITUENCY, KITUI COUNTY KENYA

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DECLARATION

This Research project report is my original work and has never been presented for any academic award in any other university.

………………………………… ……………….………

Signature Date

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L50/81284/2012

This research project report is submitted for examination with my approval as university supervisor.

………………………………… ……………….………

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DEDICATION

This research project report is dedicated to my brother Mwendwa Kuvuuka.

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LIST OF ABBREVIATIONS

ICT   Information Communication Technology

Becta   British Educational communications and technology agency.

NI3C   National Innovation and ICT Integration Centre

MOEK   Ministry of Education , Kenya

KESSP   Kenya Support Sector Education Program

ESP   Economic Stimulus Project

TAM   Technology Acceptance Model

CIE   Computer Integrated Education

NCATE   National Council For The Accreditation Of Teacher Education

UNESCO United Nations Education, scientific and cultural organization

ABSTRACT

The aim of this study was to investigate the factors affecting ICT integration in teaching and learning in public secondary schools. The research was based on theoretical framework of Technology Acceptance Model (ATM) and quantitative analysis of data collected from questionnaire based survey. The target population was 240 students, 72 teachers, 6 Principals of 6 public secondary schools in Mutito constituency, Kitui County. The questionnaires were administered to students, teachers and Principals while observation schedules were used to obtain data on number of computers, digital content in schools and their utility. For teachers and students, random sampling technique was used because of the population size while Principals were selected using non-probability sampling technique since the constituency has six secondary schools that were supplied with ICT resources by the government. The objectives of the study were to determine how access to ICT resources, students' exposure to ICT resources, teacher training on ICT skills affect ICT integration in teaching and learning in public secondary schools. In addition, the study aimed at finding out the extent to which leadership and technical support affect ICT integration in teaching and learning. The study used quantitative study where questionnaires and observation schedules where used to collect data from respondents. According to the statistical and descriptive analysis of the collected data, students in public schools have low exposure to ICT resources, teacher training on ICTs is inadequate, and ICT integration is low. The findings of the study show that where is high students' exposure to ICTs, high access to ICT resources, adequate teacher training on ICT skills and support from the school leadership there is high level of ICT integration in teaching and learning. From the research findings, secondary school teachers should be trained on ICT skills, access to ICT resources be enhanced and school leadership be proactive in supporting ICT integration in teaching and learning. the government should put in place Monitoring and evaluation mechanism for ICT integration in teaching and learning. further research need to be done to find out the impact ICT integration in teaching and learning have on performance of national examination and retention rate among secondary school students.

CHAPTER ONE: INTRODUCTION

1.1 Background to the study

The use of Information communication technology for classroom instruction is not new in the world. Information Communication Technology tools were first placed in schools in the early 1980s in the United States and will continued to be an important part of education for generations to come (Bransford & Brown, 2000).

Globally, the number of computers in secondary education has greatly increased in the last ten years. In United States, the computer to student ratio increased from 1:9 in 1996 to 1:4 in 2001. According to Market data Retrieval (2001), access to internet improved from 70% in 1997 to 92% in 2001. In New Zealand, the computer to student ratio is 1:6 in secondary schools (Lari, Pratt & Trewern, 2002) while 98% of all schools have internet connections (Mallard, 2003). Information Communication Technology is therefore prominent as education instruction tool in the world.

High rates of achievement in education are critical for transfer of technology and adoption of relevant changes in our society. Education attainment is one of the opportunity factors that will promote economic growth and reinforce equal pattern of globalization (United Nations Education, Scientific, and Cultural Organization [UNESCO], 2011). Achievements in education can be enhanced by providing opportunities for students to learn, operate and be exposed in the modern technology age.

Information Communication Technology in education has made significant progress in china for the last two decades in higher education process (Finger, et al 2007). It is highly applied for distance education based on executing agencies, target students and goals to be achieved. The use of ICT in general has become more common during the last two decades with the existence of the internet and world wide web , the internet becoming the largest collection of information in the world (Parchler, 1999). Information Communication Technology has also changed quality of education in the world and it is clear that students are changing by using ICT tools (Finger, et al 2007).

Developments in ICT have affected all sectors of the society including the education sector and its curricula. The integration of ICT into education can improve students' learning by changing the way teachers teach and the structure of their pedagogies (Shear

& Knobrel, 2003). It empowers secondary school students to develop new ways of thinking, being and acting in the world and begin learning (Khine & Fisher, 2003). In using ICTs, students can plan and build models and use internet to bring a new dimension to their learning.

In Australia, a survey of computer skills and knowledge of 6213 students tested four domains of activity to ICT adoption (Thomas & Wise, 1999). These activities are creativity (50%), information (70%), communication and educational programs (43%) and games (43%). ICT has also been in the use where instead of using ICT in education, educational technology is used. Technological education is used to support learning, delivery, development, and effective use of computers as an aid to problem solving, classroom management and leadership (Watson et-al, 2003). Hence, ICT in teaching and learning can influence changes in what and how the learners learn and reform the organization and structure of schooling itself.

In Africa, ICT is influencing every aspect of human life. It is playing a salient role in work places, business, education and entertainment. Information Communication Technology in Africa has the potential of increasing access and improving relevance and quality of education. It has facilitated the acquisition and absorption of knowledge and enhanced educational systems (Fisseha, 2011).

The adoption of ICTs in education in South Africa continued to pose challenges (Sutherland, 2004). The department of education of South Africa (2003, 17) stipulates every South African learner in general will be ICT capable by 2013. Some of the factors cited as a challenge in ICT education in south Africa are; lack of ICT access where (73% do not have access), 20.9% lack computer laboratory, 37% cited lack of internet access (Lundall & Howell, 2000). Large class sizes, software unavailability, internet failure, lack of technical support and lack of administrative support where also cited in the study about barriers to ICT integration in teaching and learning.

In Nigeria, use of ICT has been on rise in areas like bookkeeping, clerical and administrative work, stocktaking etc (Reffell & Wart, 2002). Demand for computers is on the rise in Nigeria since employees realize that computers and ICT facilities can enhance efficiency. In 1997, the Nigerian government enacted a policy on computer education to establish pilot schools and diffuse ICT innovation to all secondary schools (Okebukola, 1998). In fact, 55 percent of students in Nigeria, Algeria, Burkina Faso, Cameroon,

republic of Congo, Egypt, Mali, Rwanda, SA, Uganda, Mozambique, Senegal, Mauritius, and Lesotho had no experience at all in using computers (Goshit, 2006). Similarly, 75% of teachers have nor or very limited experience and expertise on ICT educational application in Africa.

According to a research by Kpangban and Esharenana (2010), using 176 respondents on challenges facing ICT utilization in Nigerian secondary schools, the following challenges were advanced. Poor information infrastructure (64%), lack of/inadequate ICT facilities (61%), frequent power interruption (57%), poor ICT policy (63%), inadequate technical support in schools (52%) and lack of/limited ICT skills among teachers (representing 40 percent). Ndege (2007) reported that e-learning is a "tool" that has yielded positive results in enhancing university education. She noted that ICT readiness in rural areas and within some institutions is poor, and they are not ready to exploit external connectivity. According to Makau and International Development Research Centre [IDRC], (1990), most of computer-assisted lessons observed were in mathematics and the sciences. In addition, most of the computers supplied to public secondary schools for educational instruction are being used for computer studies lessons (Makau, 1990).

Kenya has an ICT policy framework and implementation strategy with measurable outcomes since inception of National ICT Integration and Innovation Centre (NI3C). Through Economic Stimulus Project, six secondary schools in each of Kenya's 210 constituencies were provided with 11 computers, 1 laptop, 1 project, 1 printer, internet connectivity and LAN/WAN (Ministry of Education, 2010). Teachers were selected and trained at Centre for Mathematics Science and Technology Education in Africa (CEMASTEA) and others at Kenya Institute of Education (KIE) on ICT integration in teaching and learning. The teachers where trained as "ICT champions" so that they can do capacity building of other teachers at the constituency in a cascading way. Since 2010, the adoption and ICT integration has not picked up to acceptable and sustainable level (National ICT Integration and Innovation Centre [NI3C], 2012).

According to Gakuu & Kidombo (2008), head teachers should have ICT skills because they can act as change agents by encouraging and driving the adoption of ICT in teaching and learning in their schools.

1.2 Statement of the Problem

Using Information Communication Technology, teachers can enhance students learning in every subject by engaging their thinking, decision-making, problem solving and reasoning behaviors (Grabe, 2001). Information Communication Technology (ICT) in education connect student and teachers to a vast array of global stock of knowledge providing quality education, alternative sources livelihood, and ultimately, a better way of life.

It is the policy of government of Kenya to make ICT part of teaching and learning (NI3C, 2010 – MOE). A national ICT policy was promulgated in 2006 in order to improve the livelihoods of Kenya by ensuring availability, accessibility, efficient, reliable and affordable ICT service in order to integrate ICT in teaching and learning in secondary schools. According to Odera (2010), there are not many schools in Nyanza province with computers and hence there is no standard of what constitutes effective teaching and learning on computers. Although most secondary schools in Kenya have ICT facilities, the extent to which they are used for effective instructional purposes has not been empirically established (Kidombo et al, 20008). According to Kidombo (2008), however an explicit research on the factors that enhance ICT integration in teaching and learning in public secondary schools has not been done.

Information communication technology use in education in Kitui County is not different from other regions in Kenya. According to Mulwa (2012), most of schools in Kitui District do not have adequate infrastructure to support the adoption of e-learning. This means that in most of secondary schools in Kitui there is limited ICT integration in teaching and learning. Through Economic Stimulus Programme, 48 secondary schools were supplied with ICT resources for use in integration in teaching and learning (NI3C, 2012) where six schools (6) schools were supplied with ICT resources purposively for integration in teaching and learning in Mutito Constituency. There is need to study on the levels of ICT integration in order to identify the factors affecting this process. The purpose of this study was therefore to investigate the factors affecting ICT integration in teaching and learning in public secondary schools in Mutito constituency, Kitui County Kenya.

1.3 Purpose of the Study

The purpose of the study was to investigate factors affecting Information Communication Technology integration in teaching and learning in public secondary schools of Mutito constituency, Kitui county Kenya.

1.4 Objectives of the study

The following were objectives of the study:

a. To determine how access to ICT resources affect ICT integration in teaching and learning in secondary schools of Mutito constituency, Kitui County.
b. To determine how students exposure to technology affect ICT integration in secondary schools of Mutito constituency, Kitui County.
c. To determine how teacher training on ICT skills affect ICT integration in teaching and learning in secondary schools of Mutito constituency, Kitui County.
d. To determine how school leadership and technical support affect ICT integration in teaching and learning in secondary schools of Mutito constituency, Kitui County.

1.5 Research questions

The following were research questions used for this study:

a. To what extent does access to ICT resources affect ICT integration teaching and learning in secondary school?
b. How does students' exposure to technology affect ICT integration in teaching and learning?
c. To what extent does teacher training in ICT skills affect ICT integration in teaching and learning in secondary schools?
d. To what extent does leadership and technical support affect ICT integration in teaching and learning?

1.6 Significance of the study

The findings of the study may provide knowledge on the extent of ICT integration in teaching and learning in public secondary schools of Mutito Constituency, Kitui County. The information can be documented and carefully generalized by stakeholders and policy implementers. Information on factors affecting ICT integration in teaching and learning may guide the Ministry of Education and other Semi Autonomous Agencies as they roll out ICT integration to secondary schools. The findings of this study may help teachers to effectively integrate ICT in teaching and learning by putting in place adoption of the enhancing factors and best practices and at the same time being able to deal with ensuing challenges. Kenya Institute of Curriculum Development may be able to prepare digital

content in DVD and media form by applying the findings of this study. Kenya Education Management Institute will be able to enhance training and capacity building of teachers on ICT pedagogies and its utility in enhancing teaching and learning.

1.7 Delimitation of the Study

The researcher focused on factors emanating from learners, teachers, equipment/tools, leadership and technical support and how they affect ICT Integration in Teaching and Learning in secondary schools in Mutito constituency, Kitui County. The study was on ICT Integration in Teaching and Learning in all subjects offered in public secondary school curriculum. Previous studies have focused on ICT Integration in Teaching and Learning in Mathematics and Science Education and teachers' computer use for professional development strategies (Kumar et al 2008) and ICT for the teaching of word problems. Most of the secondary schools were accessible and the government has implemented supply of ICT equipment to six secondary schools in each constituency of Kitui County for use in ICT Integration in Teaching and Learning.

1.8 Limitations of the Study

Information Communication Technology integration in Teaching and Learning is a new phenomenon in Kenya and specifically in Kitui Country. As such, the researcher found out that there is limited documentation on subject of study and the conceptual framework of ICT integration was not fully developed. The schools were far apart and this posed a challenge on reaching majority of teachers. The researcher is also a teacher and time was a challenge in the research. Some of the respondents were reluctant to accept the questionnaires and in returning them in time.

The researcher overcame the challenges through use of random sampling for teachers and students at constituency level. The researcher also got permission from the employer within the research period, used research assistant in transmission and administration of questionnaire items. The researcher followed research ethics and thus convinced the respondents who filed and returned questionnaires in time. Similarly, the sample size was representative and the research findings can be generalized. The researcher made pre-visits to acquaint with the environment and create rapport with the respondents.

1.9 Assumptions of the study

In this study, the researcher assumed that, the respondents would cooperate and return the questionnaires in time, permission will be granted by the employer and that the schools in which research will be done will be in session. The research assumed that schools have computers, internet connectivity and other ICT devices and teachers in those schools are using the devices for ICT integration in teaching and learning. It was also assumed that Kenya Institute of Curriculum Development has developed digital content and availed it for utilization in teaching and learning.

1.10 Definition of important terms

Factors refer to specific and manipulative aspects or attributes existing in schools that do have a positive or negative effect on the ability of teachers to integrate ICT in teaching and learning.

ICT (Information communication technology) refers to a diverse set of information, communication, and technological resources used to transmit, store, create, share or exchange information.

ICT Integration means the use of technology in communication, data processing and storage to impart knowledge and aid in teaching and learning.

ICT Resources refers to all set of technology devices and software that can be made available to enhance teaching and learning.

Leadership means the ability of the school Principals and managers to put in place ways and measures to ensure successful integration of ICT in teaching and learning.

Learning refers to the quantitative and qualitative process of increase in or acquiring of skills, facts, methods and knowledge by an individual.

Students' exposure means the extent to which students engage and interact with ICT resources for use in learning and personal skills development.

Teacher training means the In-Service education for capacity building of teachers on new skills and teaching pedagogies.

Teaching means the process of imparting, facilitating, and guiding acquisition of knowledge, skills and attitudes by an individual.

Technical support refers to range of services and assistance provided by trained personnel in IT to help in use of ICTs and solve problems that may arise while using them.

1.11   Study organization

The study is organized into five chapters. Chapter one is an introduction to the study; chapter two is a literature review on ICT integration in teaching and learning from previous research. Methodology for the study is in chapter three where information regarding the type of research used, source of data, target population, sample size, research instruments, methods of validation, reliability of research instruments and methods of data analysis. The fourth chapter in the research report is about data presentation, analysis, and interpretation while chapter five presents discussion, conclusion, and recommendations about the findings of the study.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

The aim of this chapter was to review the literature on factors affecting adoption and use of ICT in teaching and learning in secondary schools in the world, the region and on the local scene. The researcher identified knowledge gaps and previous research limitations and recommendations. A theoretical framework of ICT Integration in Teaching and Learning was set as a guide to this research. A summary of identified factors affecting ICT Integration in Teaching and Learning, existing knowledge gaps and show how the current study shall fill the identified research gaps.

2.2 Accessibility to computers and ICT resources for teaching/learning

Using recent hardware and software resource is key to future diffusion of technology (Gulbahar, 2005). In the recent past, most of the schools were equipped with different kind of technological infrastructure and electronic resources. Such technologies include notebook computers, web spaces, email access, video conferencing, intranet etc. Efficient and effective use of technology depends on the availability of hardware and software and the equity of access to resources by teachers, students, and administrative staff. Access here would mean the opportunities afforded to both teachers and students to interact with computers and to the removal of barriers that might prevent those opportunities being taken up. Struddler, (1996) found that lack of access to computers and software was a major impediment to computer integration. To incorporate computers and other ICT tools in teaching/learning, all schools should have adequate supply of computers and related accessories. Clark (2000), states that teachers wanted more software and equipment in their classrooms. The main question here is "what is enough?" However, lack of computers was a major barrier to the effective integration and use of computers in the classroom. According to Vannatta and Beyerbach (2000), technology infusion in the classroom was still difficult to implement in American schools because of inadequate computers and software.

Availability and accessibility to computers is also identified as factors affecting ICT Integration in Teaching and Learning. According to Clark (2000) and Millar (1997), the issue of access to technology and software is still vital in the effective utilization of computers in the classroom. However, accessibility of the technology notwithstanding,

timetabling and scarce computer laboratories is still an impending factor in ICT Integration in Teaching and Learning.

According to an extract of an abstract from a research conducted by Odera (2010), there are five major problems impeding implementation of computer technology into Kenyan secondary schools. These barriers were cited as non-availability of computers, lack of proper teacher training, lack of time, inadequate or lack of physical facilities and lack of relevant software. The government of Kenya believe that computer technology has the potential to transform learning in schools by giving both teachers and learners access to vast resources against the cost of old traditional pedagogies. This leads to improved academic performance.

2.3 Students' exposure to Information Communication Technology

The teachers and students' exposure to and familiarity with IT equipment affect ICT integration. The more teachers and students are exposed with IT tools, the more they practice and use it in classroom. Exposure eliminates fear, anxiety, and curiosity that build confidence for ease of use (Farris, 2001).

A report by the National Institute of Multimedia Education in Japan (2003) proved that an increase in student exposure to educational technology through curriculum integration has a significant and positive impact on achievement in knowledge, comprehension, practical skill and presentation skill. The students exposure to ICTs means that use of images can easily improve the retention memory of students, teachers easily explain complex instructions and ensure students comprehension, teachers can create interactive classes and make the lessons more enjoyable hence improve students' attention and concentration. In the USA, some 2000 schools have collaborated with Google to use its lightweight chrome-books where more than 40% of students use some sort of tablets in their advanced national writing project classroom (**Pew Research Center and American Life Project**, 2012)

Parents believe that using computers may increase their children's academic achievement and future job opportunities (Stock & Fishman 2010). This make them buy computers with internet connection to help their children succeed in school. Today's technology revolution has brought about drop in computer prices hence parents buy computers for use at home. Children use those computers to practice what they learn at school (Stock & Fishman 2010). According to Becker (2000), students are however most likely to use home computers for entertainment than for school related purposes. Attitude held by

secondary students has a significance influence on the schools readiness to adopt e-learning (Mulwa, 2012)

Children are not only exposed to technology at home but also at school by new ICTs. Hence, schools are in need of new technology plans and designs. According to US data (NCES, 2011), teachers computer use for certain activities at school positively affects students who have available computers at home and in the library have higher levels of science literacy. Students' exposure to ICTs both at home and at school is very high but its impact on ICT integration in education has not been fully documented. Students' exposure to ICT out of school time had a larger impact on their mathematics and science achievement than their exposure to ICT at school.

2.4 Effect of Teacher training on ICT skills to ICT integration in education

According to Mulwa (2012), level of education of both Principals and teachers has the greatest influence on the readiness to adopt e-learning in secondary schools. With advent of new information technology tools such as e-mails, cameras, webcam 2.0 tools, phones, printers, socials sites and blogs will mean teachers have to gain new and improved skills in using these technologies. This means teachers must change their roles from source of knowledge, information presenters to learning resource coordinators, facilitators of knowledge acquisition and motivators who only guide learning process (Heinich, 2002).

Opie and Katsu (2000) from Britain note that the concern in ICT integration is to equip every teacher with knowledge, skills, and understanding on teaching subjects. The two researchers do not acknowledge how student's characteristics affect ICT Integration in Teaching and Learning. They are also silent on role of leadership to ICT integration.

Teachers need to be trained to change their role and responsibilities from the dispenser of knowledge to facilitators of knowledge acquisition and managers of information resources. The success of integrating ICTs into teaching and learning in developed and developing countries like Kenya depends on how teachers have been prepared to use computers. Since teachers are the backbone in curriculum implementation and integrating computers in schools, they should be trained properly in the use and integration of computers in teaching and learning. When properly trained, teachers' ability to select, integrate and evaluate computer tools to support teaching and learning will improve. Carol (2001), report that as schools become more equipped with ICT tools and resources, teachers will have to be able to make good use of e-mail, web browsers, data base, spreadsheets, word

processors, PowerPoint software, page maker, and they must gain new and improved skills in using these technologies.

The degree to ICT Integration in Teaching and Learning in developed and developing countries depend on how teachers are trained to use computers since they are backbone in any curriculum innovation (Clark, 2000). Knowledge and skills are gotten through in-service training and capacity building workshops and it helps teachers to be confident in use of ICT tools in daily lesson practices.

Sandholtz, (2001) explains how teachers who acquired knowledge and skills on use of computers led to increased levels of classroom implementation of computers. One teacher reported, "I was a nonuser of computers. Training one computer took major effort. Now I can use one well enough for classroom use as well as help students do essays". "I gained a feeling of excitement and being capable. I gained a sense of accomplishment, a feeling that helped me try new ways to use technology. Consequently, teachers knowledge and skills facilitates the subsequent integration of computers in classroom instruction", another teacher reported.

In turkey, the main problem with implementation of new ICTs was the insufficient amount of in-service training programmes for science teachers (Ozden 2007). Teachers and capacity building institutions were constraint in time for training, pedagogical training, skills training and limited initial teacher training on ICTs. Most of the recent research focused on training in digital literacy, lack of pedagogical and didactic training in how to use ICTs in the classroom, and lack of specific training concerning the use of technologies in science specific areas.

Training for teachers should focus on the ICT pedagogical issues and not just focus on ICT skills but also on pedagogical issues/aspects of ICT utilization in the classroom situation. According to Balanskat (2006), inappropriate training is not helping teachers to use ICT in classrooms and in preparing lessons.

In essence, whenever there are new ICT tools and approaches, teacher training is important (Osborne & Hennessy, 2003). Insufficient training leads to teachers being neither sufficiently prepared nor confident to carry out full integration of ICT in the classroom. Teachers should not only be computer literate but they also need to develop skills in integrating computer use into their teaching/learning programmes. Teachers need

training in technology education (study of technologies themselves) and educational technology (support for teaching using ICTs in the classroom).

According to Albirini (2006), pre-service teacher education can play a significant role in providing opportunities for experimentation with ICT before using it in the classroom teaching. Lack of ICT focus in initial teacher training/education is a barrier to teachers' use of ICTs in the classroom during teaching practice (Becta, 2004). Where there is no effective training on ICT and educational technology, teachers will not be able to use ICT resources for integration in teaching and learning.

2.5 Effect of leadership & technical support on ICT integration in education

Leadership is very important in success and adoption of technology. The support and commitment range from supervision, budgetary allocation, and enhancing access of ICT tools/resources besides motivation of ICT integrating teachers. It has been shown that the most effective way to bring about adoption and acceptance of ICT in classroom instructions is to involve all stakeholders. If all teachers in a school are included in decision making on adoption of technology, then implementation becomes easier. The leadership has to be committed to adoption of ICT so the whole team comes on board (Fullan, 1992). Where there is backing of the head of the school, with long-term ICT policy to integrate ICT in teaching and learning, there is gradual development on integration (NCET, 1994).

The success of ICT integration in teaching and learning activities dependent on the support given by the school Principal/head teacher. Teachers need on-site, classroom based technical support from qualified ICT personnel/technician. The support also includes pedagogical advice on how they can choose relevant materials from the internet and sample them out for use (Fullan, 1992). Technical support for teachers is limited in most schools. Where such support is available, it is not adequate.

For teachers to overcome barriers preventing them from using ICT, teachers require good technical support in the classroom. From the literature review, one of the most frequently cited barrier for lack of ICT integration is lack of technical support (Pelgrum, 2001).

According to Mulwa (2012), secondary schools should employ support staff members such as computer laboratory technicians or assistants before embarking on full-scale implementation of e-learning in schools within semi arid districts in Kenya. Technical

barriers impeded the smooth delivery of the lessons or natural flow of the classroom activity (Sicilia, 2005). Such technical problems take much of the teachers time needed in achieving lesson objectives. If there is no technical support available, then it is most likely that technical maintenance of broken or faulty ICT tools will not take place (Becta, 2004). Most of respondents in a survey indicated that technical faults discourage them from using ICT in teaching/learning because of the fear of ICT tools failure/breakdown during lesson presentation.

Information Communication Technology integration in science teaching needs technical support and if there no that support, this impedes ICT integration. Recent research has indicated that in some countries (United Kingdom, the Netherlands, Latvia, Malta and the Czech Republic), schools have recognized the importance of technical support to assist teachers to use ICT in the classroom (Korte & Husing, 2007).

According to Guha (2003), there is a strong positive relationship between leadership support and ICT integration in that it enhances the process and motivates the teachers to continue. The administrators role in ICT integration in teaching and learning need to be focused on allocation of resources to support management, mentoring performance, empowering staff, improving academic standards and setting clear ICT policy in the school. The leadership plays a role of supporting, recommending and sponsoring teachers for in-service training in order to update them (Clark, Cameroon & Schefller 1998).

Most of the factors affecting ICT integration in teaching and learning have been classified in groups or levels. This may be difficult to group them because of the identified complex relationship between variables. The variables cannot be considered separately since lack of technical support, time, and training can lead to technical problems resulting in lack of access to ICT tools and hence lack of teachers competence. Previous studies have not comprehensively dealt with effect of student exposure on ICT integration in teaching and learning. For example, students who are exposed to ICT resources may challenge a teacher who has no appropriate training and exposure to ICTs.

The literature does not contain adequate information on the effect of students' exposure to ICT integration in teaching and learning. It is believed that ICTs can empower teachers and learners and promote change, foster the development of 21st century skills. Information Communication Technology can empower teachers and learners, transforming teaching and learning process from being highly teacher dominated to student centered

leading to increased gains in teaching/learning processes. High exposure will help students independently or under guidance to develop problem-solving skills, informational reasoning skills and communication skills (UNESCO, 2002). Some of the barriers were given as a meta-analysis of perceived barriers hence lacking any research support from the field (Abdullah, 2009). The researcher will investigate effect of access of ICT tools, students' exposure to ICTs, teachers training in ICT skills and the role of leadership and technical support on ICT integration in teaching and learning.

2.6 Theoretical Frame Work

The research was based on the frame of Technology Acceptance & Adoption Model (TAM). This model was designed by Davis in 1989 and is based on the factors that influence user's adoption and acceptance of technology. Davis (1989) states "…user's acceptance of technology is affected by their perceptions on the usefulness and ease of use of that technology…" The acceptance is based on how one see using a particular technology system to enhance ones job performance and without much effort. Technology Adoption Model is an information systems theory that models how uses of new technology come to accept and use a technology.

Figure 2.1 - Technology acceptance model
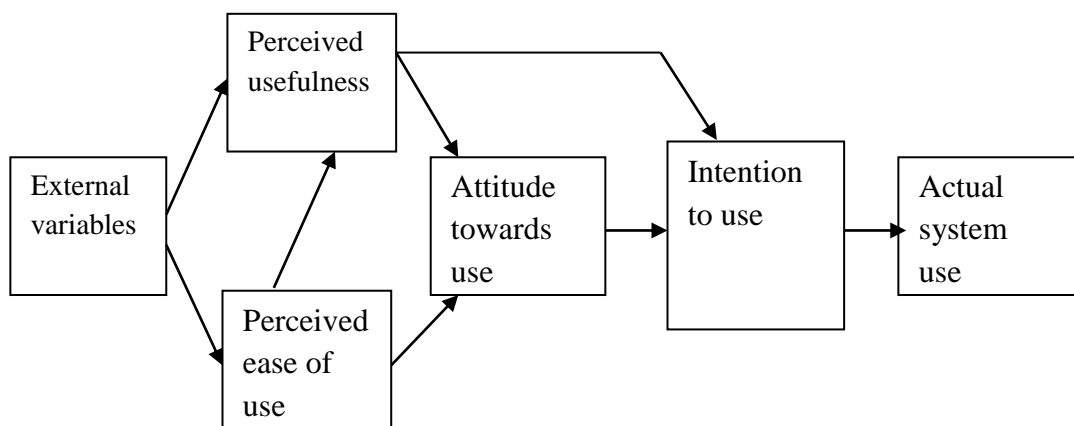
Source - Technology Acceptance Model (Davis, Bagozzi and Warshaw, 1989)

The model suggests that when users are presented with a new technology, a number of factors influence their decision about how and when they will use it. Such factors are; Perceived usefulness. This is the degree to which a person believes that using a particular system would enhance his/her job performance. Perceived ease of use. "The degree to which a person believes that using a particular system would be free from effort" (Davis, 1989).

It was proposed that people would be free to act without limitation because there are constraints (Davis & Warshav, 1982). People form attitudes and intentions towards trying to use new technology prior to directing any effort to using it.

2.7 Conceptual Frame Work

A conceptual framework is research tool used to develop awareness and understanding of a study. It helps the researcher to communicate how independent variables and dependent variables relate to each other using arrow directed diagrams (Riechel & Ramey, 1987).The relationship between the variables of the study is shown in figure 2.2.

Figure. 2.2: conceptual framework
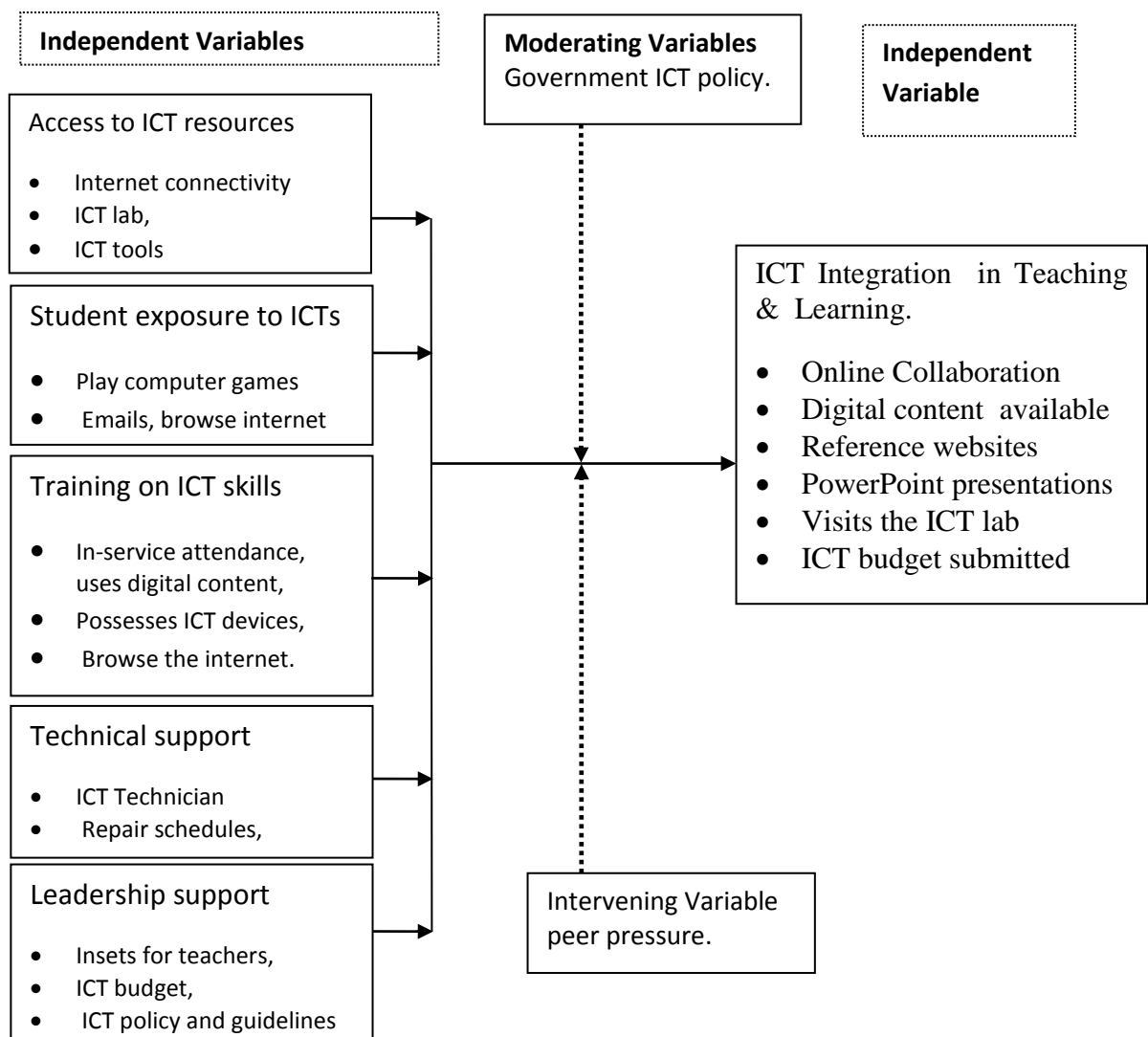
From the figure 2.2, it is envisaged that any change in ICT resource access, students exposure, teacher training in skills, administrative and technical support will affect either positively or negatively the extend of ICT integration in teaching and learning.

Government policy on ICT integration in general can affect ICT integration, such that if there is no policy framework, then the integration becomes an option all efforts notwithstanding. Peer pressure can influence how teachers and students use ICT for educational purpose. ICT integration in teaching and learning is the dependent variable.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter on research methodology consisted of description of research design, target population of the study, sample size and sampling technique, research instruments and how to validate and check on reliability of the instruments used. In addition, this chapter also consisted of data collection procedures, operational definition of variables and methods of data analysis.

3.2 Research Design

Research design is a plan, structure and strategy of investigation conceived to obtain answers to research questions (Mugenda & Mugenda, 1999). The study used descriptive and survey design. Survey design allows a researcher to gather information by questioning or interviewing respondents then summarize, present and interpret it. It helps the researcher in collecting data through interviews and questionnaires to a sample of the large population. According to Kathori (1995), descriptive survey is concerned with description, recording, analysis and reporting conditions that exist or existed. It is also economical and provides data that is easy to analyze and it is appropriate in educational research like this. This design applies to the research report since it involves collecting and analyzing a large amount of data from large population and analyzing it to make conclusions. Kitui County has 8 constituencies (www.iebc.go.ke/boundaries, 2012) with about 80 public secondary schools. This translates to about 32000 students, 4500 teachers and about 80 Principals (Ministry Of Education, 2012). Thus, survey design was most appropriate for the target population and study area (Kathori, 1995).

3.3 Target Population

The study targeted 6 secondary school Principals, 76 teachers and 240 students as they are directly involved in ICT integration in teaching and learning in public secondary schools in Mutito constituency, Kitui Kenya.

3.4 Sampling Size/Procedures

Sampling involves selection of a small group of people from the large population for study so that their information will be representative of the larger population from which they were drawn (Schumacher & McMillan, 1993). A common goal of survey research is to

collect data representative of a population in order to generalize findings from a drawn field drawn back to population within the limits of random error (Wunsch, 1986).

Random sampling for teachers and students was used so that all members of the population will have the same chance of being selected. By this way, the results were less likely to be biased and generalization to the larger population of individuals was possible (Schumacher & McMillan, 1993). Non-probability sampling method was used for six schools in the constituency because they were supplied with ICT resources by the government. The sample sizes for teachers and students was determined using 30% of sample size which is a common Percentage (%) used by researchers for large target.

Table 3.1 Sample size

Sample unit	Population size	Sampled size	(Percentage (%))
Public sec schools	6	6	5
Principals	6	6	5
Teachers	76	30	27
Students	240	72	63
Total	**326**	**114**	**100%**

Source: Education County Director, Kitui County

From Table 3.1, all the six schools (5%) and all the Principals (5%) in each of the six schools (5%) were targeted because all the schools supplied with ICT resources in Mutito constituency. Only 30 teachers were sampled out of 76, while 72 students were sampled out from the target population of 240 students.

3.5 Research Instruments

In this study, required data was collected from primary and secondary sources. Structured questionnaires, semi structured interview and document analysis were used (Mugenda & Mugenda, 1999). Questionnaires were administered to Principals, teachers and students. The aim of using the three instruments was to allow for triangulation in order to enhance reliability validity of the data collected (Schumacher & McMillan, 1993). The

questionnaires had both closed ended and open-ended items. Research aide was used to administer the questionnaires since the area of study was vast.

3.5.1 Questionnaires

Questionnaire is a research tool that gathers statistical data over a large sample with diverse backgrounds. This instrument consisted of a series of questions and other prompts for gathering information from respondents. The researcher used them because they are cheap with standardized answers that make it simple to compile data. They are also anonymous since they do not involve face-to-face interaction with researcher (Opie, 2004). Questionnaires were administered to 72 students, 30 teachers and 6 Principals in secondary schools within Mutito constituency, Kitui County.

3.5.2 Observation schedules and documentation analysis.

According to Schumacher and McMillan (1993), document analysis involves the analysis of written or visual content of a document (Gall et al., 1996, 356). The researcher used it to collect recorded data about computers and other ICT resources available in the school, to get student computer ratio and number of schools within the constituency supplied with the ICT resources by the government. The researcher also got number of INSETs at the district and constituency level for teachers on ICT integration in teaching and learning. Observation schedules were done at school level to get information on the number of computers and other related ICTs available digital content.

3.6 Validity of instruments

Mugenda and Mugenda (1999), defines validity as the accuracy and meaningfulness of inferences based on research results. This study applied content validity as a measure of the degree to which data obtained from the research is accurate. The questionnaires were distributed during student science and engineering fair, at school level. They were tested for Validity and reliability after piloting and the questionnaire did not reveal any serious defects. Test retest technique was employed where questionnaires were issued to five (5) respondents. After 3 days, the questionnaires were administered to the same group. Minor corrections to the wording of some questions were made following the feedback from this trial. The study questionnaire, interview schedule, and documented analysis were used to achieve triangulation, which made findings valid.

3.7 Reliability of instruments

According to Mugenda and Mugenda (1999), reliability is the degree to which results obtained from the analysis of data represents the phenomenon under study. To test for reliability of the instrument used, Split-half method was used. Split half is a method used to gage the reliability of a test; two sets of scores are obtained from the same test, one set from odd items and one set from even items, and the scores of the two sets are correlated to compute spearman's correlation constant. Split-Half Reliability method assumes that, if a test is reliable, a student should score equally as well or poorly on two randomly selected halves of the test. The **Spearman-Brown Formula** was used in estimating the reliability using the split half method.

$$r_{xx} = k \, r \, / \, (1 + (k - 1))r \, .$$

Where: k = number of items in the 'new' split-half test (i.e., usually the original number of questions your test had before you split it) divided by the number of original items in the split-half test (i.e., the number of question in your split-half correlation). A spearman's r, greater than 0.80 was obtained showing that the instruments were reliable

3.8 Data collection procedures

The researcher secured introductory letter from University of Nairobi to act as an identity and obtained research permit from Ministry Of Education (National Council of Research Science and Technology, NAST) in order to collect data in public secondary schools. Piloting of the research instruments were first tested for reliability by piloting on 8/05/2013. Data collection took place from 12/05/2013 and lasted four weeks. The researcher made appointments prior to all visits. This helped the researcher to familiarize with the environment and respondents (Kasomo, 2006). The respondents were given enough time to give full information and were asked to hand over the questionnaires immediately after filling them. A transect survey was conducted around the school to make observation related to computer laboratories, number of ICT devices (computers, printers, laptops, projectors, Digital content CDs etc), power and internet connectivity.

3.9 Methods of data analysis

Collected data was grouped according to research objectives and research questions. Quantitative data was analyzed using descriptive statistics such as totals, frequencies and Percentage (%)s. Tabulation was used for data presentation Data collected from questionnaires was edited, coded and analyzed using Microsoft excel software within quantitative research approach to generate totals, frequencies, percentages (%) and the mean.

3.10   Ethical considerations

The confidentiality of respondents involved in the study was maintained because they were not asked to identify themselves in the research instruments. The researcher made formal requests in order to obtain data through observation and documentation within the areas of interest.

3.11   Operational definition of variables

The researcher collected data on factors affecting ICT integration in teaching and learning as the dependent variable while access to ICT resources, student's exposure to ICT resources, teacher training on ICT skills, leadership and technical support on ICT integration were the independent variables. The researcher assessed factors affecting dependent variables using questionnaires, observation schedules and documentation. The corresponding indicators and tools of analysis are shown in Table 3.3.

Table 3.3 Independent and dependent variables

Objectives	Independent variables	Dependent variable	Tools of analysis
To determine how access to ICT resources affect ICT integration in education.	• Possession of ICT devices • Frequency to laboratory • ICT Laboratory available • Laboratory time tables	ICT Integration in teaching And learning.	Totals, Frequencies (f), mean Percentages
To determine how students exposure to technology affect ICT integration .	• Possesses ICT devices • Browse/surf the net • Online chatting/collaboration • Personal e-mail. • Play computer games		Totals, Frequencies (f), Percentages (%), mean

To determine how teacher training on ICT skills affect ICT integration.	• ICT certificates • Develops/downloads digital content • Possession of ICT device	Totals, Frequencies (f), Percentages (%), mean
To determine how school leadership and technical support affect ICT integration.	• Technician • Repair and maintenance schedules • School ICT policy and integration guidelines. • Budget on ICT resources. • Attendance of ICT seminars	Totals, Frequencies (f), Percentages (%), mean

From Table 3.3, the independent variables are access to ICT resources, students' exposure to ICTs, teacher training on ICT skills and leadership/technical support. Any change in these variables will positively or negatively affect ICT integration in teaching and learning. Measurable and verifiable indicators for each independent variable have been stated.

CHAPTER FOUR: DATA ANALYSIS, PRESENTATION AND INTERPRETATION

4.1 Introduction

This chapter consists of data presentation, analysis and interpretation of collected data from the field. The analysis, presentation and interpretation focused on the data related to objectives of the study and the study questions. Open ended questions were analyzed by grouping similar responses and tally system used to generate frequencies and percentages. In this chapter, data has been presented in form of Tables and analyzed with totals, frequencies and Percentages (%) generated using Microsoft excel software.

4.2 Response rates

For the purpose of data collection, 30 questionnaire items for teachers, 72 for students were distributed. Observation schedules and documentation analysis was done for six secondary schools where principals were the respondents. The teachers returned 29 questionnaires representing 97% return rate, while 68 questionnaires issued to students were returned representing 95% response rate. Response on observation schedules with principals was 100%. This means the overall 103 questionnaire items were collected representing an overall response rate of 96%. Only 4% of the sampled population failed to response due to vastness of the area and some respondents not willing to participate in the survey. According to the researcher, the response rate was satisfactory and data collected can be generalized.

4.3 Demographic information

The data collected in this category was intended to find out the distribution of the respondents based on gender, age and education level of the respondents in public secondary schools of Mutito Constituency in Kitui County. Out of all the questionnaire items administered, 68 were returned from students and 29 returned by teachers.

4.3.1 Students' Demographic information

To obtain this data, the researcher asked questions to know the distribution of respondents based on age, gender, and class (form). The Frequency (f) for each category was found

and Percentages (%) calculated using the following formula and the results presented in table 4.1.

$$\text{Percentage (\%)} = \frac{\text{Frequency (f)}}{\text{Total}} \text{x100}$$

Table 4.1. Students' Demographic information

Demographic factors	Male		Female	
	Frequency (f)	Percentage (%)	Frequency (f)	Percentage (%)
Gender/sex	35	51	33	49
Age below 18 years	25	71	24	63
18-25 years	10	29	9	27
Class/form I	8	23	7	21
II	10	29	11	33
III	10	29	9	27
IV	7	20	8	24
Totals	**35**	**51**	**33**	**49**

From Table 4.1, 51% of the students surveyed were male while 49% were female. Of the male students, 71% were aged below 18 years with 29% above the age of 18 years and in form three (29%). From 4.1, 63% of female students were below 18 years of age, 27% above 18 years and majority in form two(33%).

The data in table 4.1 show that there are more male students than female students at 51% and 49% respectively. This may be due to low transition rate of girls from one level of education than boys, early pregnancy at secondary or class repetition among girls or resulting from lack of awareness among parents on affirmative actions for girls. More students in from two and from three at 29% compared to 20% in form four according to Table 4.1, may be caused by high class transition rate from form one and transfers from other schools due to availability of ICT resources in the school.

4.3.2 Demographic factors for teachers

In this section, the researcher collected data on age, gender, education level and experience (length of service) from respondents in order to understand their demographic characteristics and the levels to which they affect ICT integration in teaching and learning as presented in Table 4.2.

Table 4.2. Demographic factors for teachers

Demographic factors		Frequency (f)		Percentage (%)	
		Male	Female	Male	Female
Gender		16	13	55	45
Age in years	18-25	2	2	13	15
	26-30	4	2	25	15
	31-35	6	5	38	38
	36-40	2	2	13	15
	Over 40	2	2	13	15
Educational level	Diploma		4	0	31
	Degree	16	9	100	69

From Table 4.2. 55% of respondents were male teachers and 45% were female. Majority of male teachers were aged 31-35 years (38%) just as female teachers. All male teachers had a degree education while 50% of female teachers were diploma holders and 69% had degree qualification.

There are more male teachers at 55% than female counterparts at 45% in secondary schools. This may be due to low transition rate to post secondary colleges or female females taking up teaching jobs,. Majority of the teachers are aged between 26-30 years representing 38% for both male and female teachers. Early retirement or change of careers may contribute to low number of teachers aged over 40 years in secondary schools.

4.3.3   Demographic factors for Principals

In this section, the respondents were asked to state their age, gender and education level because they provide leadership in ICT integration in teaching and learning and the data presented in Table 4.3

Table 4.3. Demographic factors for Principals

Demographic factors			Frequency (f)		Percentage (%)	
			Male	**Female**	**Male**	**Female**
Gender			5	1	83	17
Age in years		30-35	0	0	0	0
		36-40	0	0	0	0
		Over 40	5	1	83	17
Educational level	Diploma		1	0	17	0
	Degree		4	1	67	17

From Table 4.3, 83% of the teachers who respondent were male and 17% female. Most of the teachers surveyed had experience between 2-5 years and had degree qualification (83%) and only 17% had diploma in education.

According to Table 4.3, there are female teachers who are principals representing 17% compared to 83% of male principals. Due to experience required and job group criteria for one to be a principal, majority of the principals are aged above 40 years. 67% of male principals had a degree and only 17% of male principals had a diploma qualification. This means that females still have challenges on access to higher education.

4.4   Factors affecting ICT integration in teaching and learning

In this sub section, the researcher presents data analysis of opinion of respondents on factors affecting ICT integration in teaching and learning in Public Secondary Schools. All likert scale responses have been tabulated together in frequencies and Percentage (%)s in order to make interpretation on respondents' level of agreement or disagreement on given

statements. Effect of students' exposure to ICT on ICT integration in teaching and learning.

In this section, the researcher collected information from respondents in order to find out the students' exposure to ICT resources and whether the exposure has a positive or negative effect on ICT integration in teaching and learning.

4.4.1 Students' response on exposure to computers and ICT resources

Respondents were asked to rate their students on their level of ICT skills and whether the level of exposure affects how they teach and learn using ICT devices and tools. The data was presented in Table 4.4.

Table 4.4. Students' response on exposure to computers and ICT resources

Respondents	Very low Frequency (f)	%	Good Frequency (f)	%	Satisfactory Frequency (f)	%	Very high Frequency (f)	%	Neutral Frequency (f)	%
Students	11	50	2	3	0	0	0	0	3	4
Teachers	6	86	1	10	0	0	0	0	0	0
Principals	2	34	1	17	0	0	0	0	3	50
Total	**16**		**7**		**0**	**0**	**0**	**0**	**8**	**0**

According to Table 4.3, 34% of students rated their exposure as very just as 90% of teachers and 34% of Principals who rated their students' ICT skills as being very low. Only 34% of students and 17% of Principals rated the students ICT skills as good.

4.4.2 Students' response on ICT resources/devices they have access

The data in this section aimed at evaluating the exposure levels of students to Information technology resources, which could help the researcher, make an opinion on the students' exposure. The data is presented in Table 4.5.

Table 4.5. Students' response on ICT resources/devices they have access

ICT device in possession	Frequency (f)	Percentage (%)
Phone	56	82
Laptop and modem	2	3
Video camera	0	0
Others	2	3
None	8	12
Total	**68**	**100**

According to Table 4.5, 82% of students had access to different kinds of phones and only 12% had no access to any ICT resources. However, only 3% of all students have access to Laptops and modems.

4.4.3 Students' response on whether they have attended ICT integrated lessons

The respondents were asked to state whether they have attended lessons in which ICT resources were used in teaching and learning and the data presented in Table 4.6.

Table 4.6. Students' response on whether they have attended ICT integrated lessons

Response	Frequency (f)	Percentage (%)
Yes	56	82
No	12	18
Total	**68**	**100**

From Table 4.6, at least all students in each form have attended lessons in which ICTs were used to deliver the lesson instructions. This is because only 18% of the student respondents said they have never attended ICT integrated lessons in the classroom but they had used computers and the internet to search for information, chat and revise.

4.4.4 Students' response on rate of access to ICT resources

In this subsection, the researcher used questionnaires to obtain data regarding student's opinion on their rate of access to ICT resources on daily, weekly and occasional bases. The responses are presented in Table 4.7.

Table 4.7. Students' response on rate of access to ICT resources

Access rate	Frequency (f)	Percentage (%)
Daily	0	0
Weekly	56	82
Occasionally	10	15
None	2	3
Total	**68**	**100**

From Table 4.7, 82% of students surveyed had access to ICT resources on weekly basis and only 3% had no access at all. This shows that students have access to computers, phones, laptops, radios, camera and some internet connectivity.

4.4.5 Students' response on use of their free time

The researcher collected data by asking respondents how they used their free time so as to analysis on how use of their free time is affected by or affect ICT integration in teaching and learning. The data obtained in this section is shown in Table 4.8.

Table 4.8. Students' response on use of their free time

Use free time	Frequency (f)	Percentage (%)
Socializing	14	21
Watching video and computer games	6	9
Surf/browsing the internet	34	50
Practice and learning	14	21

Analysis in Table 4.8 shows that 50% of students spent their free time on the internet surfing/browsing while 21% spent time practicing and learning. Only 9% spent time watching video and playing computer games.

4.4.6 Students' opinion on whether they know how to operate a computer

In this section, the researcher asked respondents to state whether they know how to operate a computer or any ICT device. The responses are presented in Table 4.9.

Table 4.9. Students' opinion on whether they know how to operate a computer

Know how to operate a computer	Frequency (f)	Percentage (%)
Yes	32	48
No	36	52
Totals	**68**	**100**

From Table 4.9, 52% of students do not know how to operate a computer and only 48% know how operate/use a computer.

4.5 Effect of teachers training in ICT skills on ICT integration in teaching and learning

The data in this section was meant to get information on whether the respondents had any training on computers and ICT integration skills in teaching and learning and the effect the training or lack of training had in ICT integration in teaching and learning in public secondary schools

4.5.1 Category of subjects taught by teachers

The respondents were asked to indicate the subject teach and the responses are presented in Table 4.50

Table 4.50 Category of subjects taught by teachers

Subject category	Frequency (f)	Percentage (%)
Languages	6	14
Humanities	9	29
Sciences	10	43
Mathematics	4	14
Total	**29**	**100**

From Table 4.50, majority of teachers teach science subjects representing 43%, 14% teach languages, 29% of respondents teach humanities and 14% of teachers teach mathematics.

4.5.2 Respondents' opinion on whether they trained on computer skills

In this subsection, the research collected data from respondents by asking them, to state whether they had acquired ICT skills and the level at which they trained or acquired such skills. The data on their responses is presented in Table 4.51

Table 5.1. Respondents' opinion on whether they trained on computer skills

Group	None		Primary		Secondary		College		seminars	
	Frequency (f)	Percentage %	Frequency (f)	%	Frequency (f)	Percentage %	Frequency (f)	(%)	Frequency (f)	%
Teachers	0	0	2	7	3	10	2	29	41	60
Students	8	12	4	6	56	82	0	0	0	0

From Table 4.51, 10% of teachers had trained on computers at secondary level compared to 82% of students at secondary level. A big Percentage (%) of teachers (60%) was trained at seminars/workshops.

4.5.3   Teachers' response on the skills they were trained on

The researcher asked respondents to state the skills they had trained on and their responses presented in Table

Table 4.52 Teachers' response on the skills they were trained on

Skills	Frequency (f)	Percentage %
Computer skills	20	69
Software/hardware	5	17
ICT integration skills	10	35
ICT pedagogies	50	73

From Table 4.52, majority of teachers trained on both computer skills and ICT pedagogies at 69% and 73% respectively. In addition, 35% of teachers trained on ICT integration skills.

Table 4.53 Opinion of teachers on whether teachers have ICT integration skills

Teachers have ICT skills	Frequency (f)	Percentage %
Yes	52	67
No	16	33
Total	**68**	**100**

Table 4.53 shows that 67% of teachers have ICT integration skills with 33% saying they had no ICT integration skills.

4.6   The effect of access to ICT resources on ICT Integration in teaching and learning

To obtained data analyzed below, the researcher wanted to know whether the respondents have access to ICT resources, the rate of access and how this access to ICT resources affect ICT integration in teaching and learning.

4.6.1 Opinion of respondents on access to ICT resources

To obtain data in this section, the researcher asked respondents to state where they access ICT resources and their responses were recorded in Table 4.54

Table 4.54 Opinion of respondents on access to ICT resources

Respondents	At home		School		Seminars		Cyber café		Community centers	
	Frequency (f)	%	Frequency (f)	%	Frequency (f)	%	Frequency (f)	%	Frequency (f)	%
Students	4	6	56	82	0	0	10	15	3	4
Teachers	8	28	15	52	20	70	10	34	5	17

From Table 4.54, more teachers (70%) access ICT resources in seminars and 52% at school. Majority of students have access to ICTs at secondary school, 15% at cyber café and 28% at home. Only 6% of teachers have access to ICTs at home.

Table 4.55 Opinion of Principals on access to ICT laboratories

ICT laboratory accessible	Frequency (f)	Percentage (%)
Administrators only	1	17
Teachers only	3	50
Students alone	0	0
Students with a teacher	2	34
Total	**6**	**100**

From Table 4.55, 50% of Principals said ICT laboratory is accessible to teachers only but 34% allowed students to ICT laboratory when accompanied by teachers. Students are not allowed in the ICT laboratory alone.

4.6.2 Teachers' responses on of use of internet, computers and other ICT devices

In this section, the researcher collected data from respondents on whether they use the internet, computers and other ICT devices for teaching and learning. The responses are recorded in Table 4.56

Table 4.56. Teachers' responses on of use of internet, computers and other ICT devices

Uses computers/ICT resources	Frequency (f)	Percentage (%)
Yes	65	96
No	3	4
Total	**68**	**100**

Table 4.56 shows that 96% of teachers use the internet, computers and other ICT devices while only 4% of teachers do not use the internet.

4.6.3 Responses by teachers on length of service

The researcher collected information in this section by asking the respondents to state their length of service and the results presented in Table 4.57.

Table 4.57. Responses by teachers on length of service/experience

Experience in years	Frequency (f)	Percentage (%)
Below 2	5	17
2-5	10	33
More than 5	14	48
Total	**29**	**100**

From Table 4.57, 48% of teachers have teaching experience of more than 5 years, 35% between 2 to 5 years, and 17% with an experience less than 2 years.

Table 4.58 Teachers' opinion on use of ICT integration in teaching and learning

Rate of ICT integration	Before training		After training	
	Frequency (f)	Percentage(%)	Frequency (f)	Percentage(%)
Very often	2	7	2	7
Often	14	48	18	63
Rarely	11	38	8	27
Never	2	7	1	3
Total	**28**	**100**	**28**	**100**

According to Table 4.58, 48% of teachers often use ICT integration in teaching and learning before training but this increased to 63% after training. This means that teacher training on ICT integration enhances ICT integration in schools.

Table 4.59 Teachers' response on areas of use of ICT resources

Purpose/used in	Frequency (f)	Percentage (%)
Access internet for teaching and learning resources	14	48
Keep students database	10	34
Prepare and present PowerPoint lessons	16	55
Prepare professional documents	14	48
Upload/download digital content	11	38
Collaboration/sharing	10	34

From Table 4.59, there are more teachers using ICT to prepare PowerPoint lessons (55%) than those using it to prepare professional documents and access the internet for teaching and learning resources. There are only 34% of teachers who use ICTs to keep students database and the same Percentage (%) use ICTs to collaboration and sharing.

Table 4.60 Principals' opinion on factors affecting ICT integration in integration in teaching and learning in public secondary schools

Key: 1 – Strongly agree, 2 – Agree, 3 – Disagree 4 – Strongly disagree, 5 – Neutral

Research variable	Questionnaire item	Likert scale response Percentage (%)				
		1	2	3	4	5
High access to ICT resources enhances integration	Item 9	67	0	0	16	17
Attendance of ICT seminars by teachers	Item 10	0	0	67	18	15
Teachers are effective in ICT integration	Item 11	13	17	70	0	0

From Table 4.60, four out of six Principals strongly agreed that high access to IT resources enhanced ICT integration in teaching and learning representing 67%. According to the Principals, the teachers are not effective in use of the ICT resources for integration (70%) compared to those who strongly agreed that teachers are effective in ICT integration in teaching and learning.

4.6.4 Teachers' opinion on factors affecting ICT integration in teaching and learning

The data in this section obtained from teacher using likert type questionnaire items. The questionnaire items were aimed at getting responses from teachers on the degree to which they agree or disagree to statements about factors affecting ICT integration in teaching and learning in public secondary schools of Mutito Constituency. The likert scale key and data obtained was presented in Table 4.61. The researcher used the key shown below for the likert scale type questionnaire items.

Key: 1 Strongly agree, 2 Agree, 3 Disagree, 4 Strongly disagree, 5 Neutral.

Table 4.61 Teachers' opinion on factors affecting ICT integration in teaching and learning

Research variable	Questionnaire Item	1	2	3	4	5
Students exposure to ICT resources						
Exposure enhances integration	Item-6	13	14	0	0	2
Exposure leads to distraction	Item-7	10	4	8	2	5
Accessibility to ICT resources						
Teachers have direct access to ICT resources	Item-10	13	4	14	0	0
Internet is accessible	Item-12	15	4	3	7	0
Teacher training						
Teachers are sponsored for ICT seminars	Item-22	0	8	11	4	6
Teachers ICT skills are adequate	Item-23	12	14	1	2	0
There is need for training on ICT skills	Item-24	15	10	3	0	1
Further in-service is needed by teachers	Item-25	20	6	0	2	1
Teacher has basic faulty tracing skills	Item-26	1	4	4	10	11
Further training enhances ICT integration	Item-27	18	9	0	2	0
Teachers can prepare/present ICT lessons	Item-29	10	8	4	7	0
Leadership and technical support						
ICT integration is involving without technical support	Item-30	11	15	1	2	0
Principal encourages ICT integration	Item-31	8	14	0	4	3

Note: The header spans "Likert scale Frequency (f)" over columns 1–5.

ICT integration budgets are passed in time	Item-32	0	8	2	9	10
Teachers are sponsored to attend ICT seminars	Item-33	2	2	1	12	12
Teachers have enough time to prepare/present ICT lessons	Item-34	1	2	13	11	2
There is emergency source of power	Item-35	1	4	12	12	0
Schools has ICT integration policy and guidelines	Item-36	1	5	11	12	0
Technical support will enhance ICT integration	Item -37	13	14	1	0	0
School leadership support enhances ICT integration	Item-38	14	13	2	0	0

From Table 4.61, teachers agreed that exposure of students to ICTs enhanced ICT integration in teaching and learning (86%) with only 15% not sure of the effect. However, from Table 4.61, the higher the level of exposure, the more the students get distracted from learning by internet and computer games (58%). This calls for proper class management skills.

According to Table 4.61, 56% of teachers have direct access to ICT laboratory with only 43% having limited access. Where there is high access rate, ICT integration levels were high. Internet and worldwide webs are available to teachers (58%), but more need to be done to enhance connectivity and internet speeds.

From Table 4.61, there are more teachers who are sponsored to attend non ICT related seminars (58) compared to 43% of teachers who attend ICT related seminars. Generally, 71% of teachers agreed that the ICT skills acquired through the seminars/workshops attended are adequate while only 28% felt that the skills are inadequate. In addition, 86% of teachers said further training would enhance and increase the levels of ICT integration in teaching and learning but 16% were non-committal.

According to Table 4.61, only 43% of teachers can fully prepare and present ICT PowerPoint lessons without technical support while 58% needed support to prepare and present PowerPoint lessons. 72% of teachers generally agreed that the school leadership does not pass ICT related budgets in time with only 15% of school Principals encourage encouraging ICT integration in teaching and learning.

4.7 Effect of leadership and technical support on ICT integration in teaching and learning

In this section, the respondents were asked questions in order to give data pertaining the effect of leadership and technical support on ICT integration in teaching and learning. The data collected corresponded to availability of alternative source of power for ICT devices, the number of computers and other ICT resources supplied by the government, the number of operational computers and whether there is an ICT integration policy and guideline in the school. The data was presented in Table 4.62, Table 4.63, Table 4.64 and Table 4.65.

Table 4.62 Opinion of Principals on availability of alternative source of power

Alternative source of power	Frequency (f)	Percentage (%)
Yes	2	34
No	4	66
Totals	**6**	**100**

From Table 4.62, only 2 (34%) out of 6 schools surveyed had alternative source of power. Out of the school, 66% had no alternative source of power and are not connected to the national grid.

Table 4.63 Principals' responses on number of computers and ICT tools supplied to schools

Number of computers	Frequency (f)	Percentage (%)
Below 10	0	0
10-25	6	100
Above 25	0	0
Total	**6**	**100**

From Table 4.63, all the schools surveyed had received more than 10 computers but none received more than 25 computers. According to the observation schedule, all the schools had received a projector, laptop, a printer and internet connectivity for the ICT

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laboratory. There is only one teacher who was trained as a constituency ICT champion to train other teachers in ICT integration in teaching and learning.

Table 4.64 Number of operational computers/ ICT resources

Number of operational ICT resources	Frequency (f)	Percentage (%)
All	6	100
Half	0	0
None	0	0
Total	**6**	**100**

From Table 4.64, at least all the ICT resources are operational and technicians are called in to repair faulty machines.

Table 4.65 Principals' opinion on availability of school ICT policy and integration guidelines

Availability of ICT policy and integration guidelines	Frequency (f)	Percentage (%)
Yes	2	34
No	4	66
Total	**6**	**100**

From Table 4.65, very few schools had ICT policy and integration guidelines (66%) compared to 34%, which had. Most of the Principals felt that increasing access to ICT resources, further capacity building and training of teachers on ICT skills and having standby technical support for IT would enhance ICT integration in teaching and learning.

4.6.1 Principals' opinion on ICT seminars/workshops attendance by teachers

In this section, the respondents were asked to provide information regarding the number of seminars which teachers have attended related to ICT integration in teaching and learning. The data is presented in Table 4.67.

Table 4.66 Principals' opinion on ICT seminars/workshops attendance by teachers

Teachers attendance of ICT seminars	Frequency (f)	Percentage (%)
Two	3	50
More than two	1	16
None	0	0
Not allowed to attend	0	0
Neutral	2	34
Total	**6**	**100%**

From Table 4.66, teachers allowed to attend more than three ICT related seminars (50%) compared to 16% of teachers who had attend more than two seminars in one year.

4.6.2 Respondents' opinion on how to enhance ICT integration in teaching & learning

In this section, the researcher asked the respondents open ended questions on how to enhance ICT integration in teaching and learning. the questions were open ended and the researcher grouped the responses according to similar themes. Tallying was done for the themes from which totals, frequencies and percentages were computed. The data is presented in Table 4.67.

Table 4.67 Suggestions by the respondents on ways of enhancing ICT integration in teaching and learning in public secondary schools

Suggestion	Students		Teachers		Principals	
	Frequency (f)	Percentage %	Frequency (f)	Percentage %	Frequency (f)	Percentage %
Buy more ICT devices	30	44	8	28	5	84
More time for computer learning	11	16	10	35	0	0
Allow students have phones in schools	56	82	2	7	0	0
Train teachers on computers	30	45	10	35	3	50
Develop syllabus digital content	30	14	0	0	0	10
Teach students on ICTs/computers	50	74	18	62	2	4
Enhance access to ICTs for all	40	59	20	69	1	17

From Table 4.67, 44% of students suggested buying of more computers/ICT devices to enhance ICT integration in teaching and learning with the Principals giving the highest suggestion (84%). Similarly, 35% of teachers suggested that more time would enhance integration of ICT in teaching and learning. In addition, 82% of students felt that allowing students to possess and use internet-enabled phones in school would enhance ICT integration in teaching and learning. A big Percentage (%) of Principals (50%) than teachers (35%) suggested that further training would enhance ICT integration in teaching and learning. 14 % of students suggested that the syllabus content should be converted to digital form while 62% of teachers want students be trained on ICT skills.

CHAPTER FIVE: SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATION

5.1 Introduction

This chapter presents summary of findings, discussion, conclusion, and recommendations about the research project on factors affecting ICT integration in teaching and learning in public secondary schools.

5.2 Summary of the findings

The purpose of this study was to investigate the factors affecting ICT integration in teaching and learning in public secondary schools. The objectives of the study were to determine how access to ICT resources, how students exposure to technology, how teacher training on ICT skills and how school leadership and technical support affect ICT integration in teaching and learning in public secondary schools in Mutito constituency, Kitui County Kenya. The researcher wanted to answer the following questions: To what extent does access to ICT resources, students' exposure to technology, teacher training in ICT skills affect ICT integration in teaching and learning in public secondary schools? The last question was; to what extent does leadership and technical support affect ICT integration in teaching and learning in public secondary schools? The research employed a survey design where questionnaires, documentations, and observation schedules were used to collect data from the respondents and areas of study.

The researcher found out that access to ICT resources, high students exposure to ICT resources, adequate teacher training on ICT skills positively affect ICT integration in teaching and learning. However, the findings show school leadership and technical support provided to teachers has an effect on extent of ICT integration in teaching and learning.

5.2.1 Availability of ICT resources in public secondary schools

The study found that the government of Kenya has supplied more than 10 computers and other ICT resources to 6 public secondary in each constituency. Some school received 21 computers. All the schools were supplied with a printer, laptop and projector, form one and form two digital content for all subjects. In addition, the government of Kenya released funds where local area network (LAN) connectivity was done to enhance internet access within the school. This finding is in line with the government ICT policy

framework 2006 on preparing schools for e-readiness and in agreement with Mulwa (2012), who recommended the need of ensuring availability of ICT infrastructure for ICT integration in teaching and learning. These findings also concur with Wanjiru (2012) who reported that the government has provided a mechanism of facilitating availability of ICT equipment to public secondary schools. However, Wanjiru (2012) did report on the mechanism taken by the government to prepare secondary schools for e-readiness.

From the research, teachers in public secondary schools lack required technical support to assist those with inadequate ICT integration skills. In addition, adequate teacher training on ICT integration pedagogies, high access to ICT resources and leadership support are the factors positively affecting ICT integration in teaching and learning in public secondary schools. Struddler (1996), Clark (2000) and Millar (1997) reported on the issue of lack of access to technology and software as a factor negatively affecting utilization of ICTs in the classroom corroborates this.

5.2.2   Effect of access to ICT resources on integration in teaching and learning

Information Communication Technology access among secondary school students and teachers is very vital for success of ICT integration in teaching and learning. According to the study and the UNESCO (2000) ICT integration model, ICT access and usage are related and respondents in this study are at applying stage while others are at infusing stage of ICT resources. From the study, 82% of students have access to internet-enabled phones and 3% to laptops with internet connectivity. Among the teachers, 52%, 70% and 34% have access to ICT resources at school, during seminars and cyber cafés respectively. According to the research, 67% of teachers strongly agreed that high access to ICT resources enhances ICT integration in teaching and learning. Therefore, with access to ICT resources in schools, students and teachers can make use of them in teaching and learning.

5.2.3   Effects of students' exposure to ICT resources on ICT integration in teaching and learning

Students' exposure to ICT resources in secondary schools is growing. Students have to phones, laptops, desktops and the internet. According to this study, 82% of students surveyed have access to ICT on weekly basis and 82% have attended ICT integrated lessons. A good Percentage (%) of students (48%) know how to operate a computer with 82% of the students having access to ICT resources at secondary schools. 67% of teachers

surveyed strongly agreed that high access to ICTs by students enhances ICT integration in teaching and learning. This research adds to the body of knowledge on how high students' exposure to modern Information communication technologies affects ICT integration in teaching and learning. Farris (2001) reported that students' exposure to ICT resources eliminates fear, anxiety and curiosity thereby building confidence for ICT use in learning. In this research, students' exposure to ICT resources and devices enhance ICT integration because teachers build on the students' curiosity, interest to Information technology and online collaboration hence enhancing knowledge retention through research and sharing. A similar report by national institute of multimedia education in Japan (2003) reported that increased students' exposure to educational modern pedagogies has a significant and positive impact on achievement in knowledge, practical skills and comprehension.

This study found out that students are most likely to be distracted in using computers and the internet as they use to play computer games and access other online materials. Again, this has a positive effect on student's cognitive skills and motor skills essential for use of information communication technology devices. According to the research findings, ICT integration in teaching and learning is very relevant for languages, sciences, humanities and mathematics. This is in contrast to a report by NCES (2011), Makau and International Research Centre (1990) reporting that most of computer assisted lessons observed in mathematics and sciences.

5.2.4 Effect of teacher Training in ICT skills on ICT integration in teaching and learning

Teacher training on ICT integration skills positively affects ICT integration in teaching and learning. This is in line with Opie (2000) and Clark (2000) who reported that knowledge and skills acquired through in-service training and capacity building of teachers help to build confidence on use of ICT tools. Teachers who acquire pedagogical skills on ICT integration leads to increased level of integration of ICTs in teaching and learning. This research has established that in-service training of teachers should focus on ICT pedagogical skills and not just computer skills. According to the research, there is improved ICT integration in teaching and learning when teachers attend seminars on new ICTs and emerging technologies.

5.2.5 Effect of leadership and Technical support on ICT integration in teaching and learning

From the research, school leadership and lack of technical support during ICT integration negatively affects ICT integration in teaching and learning. Most of the schools have not prepared school ICT policy and integration guidelines. This is in line with Kidombo (2008) who reported that there is lack of clear policy or will by school leadership to integrate ICT. There is improvement on ICT integration in teaching and learning when there exists a school ICT policy and integration guidelines. The school leadership support include passing ICT related budgets in time, recommending and sponsoring teachers for seminars, setting up clear school ICT policy and integration guideline. From the research, (88%) teachers surveyed agreed that ICT integration is involving without technical support with 89% of the teachers agreeing that technical support will enhance ICT integration in teaching and learning. As reported by Pelgrum (2001), lack of leadership and technical support are negatively affecting ICT integration in teaching and learning. the findings on technical support and leadership support is in line with Mulwa (2012) who reported that school Principals should employ required technical support personnel before embarking on any full-scale implementation of e-learning. Lack of technical support impedes the smooth delivery of the lesson or natural flow of the classroom activity (Sicilia, 2005).

5.3 Conclusion

The supply of ICT resources by the Government of Kenya to public secondary schools in each constituency in general has boosted ICT integration in teaching and learning in Mutito constituency, Kitui County. The factors positively affecting ICT integration in teaching and learning are students' exposure to ICTs, Teacher training on ICT pedagogies and high access to ICT resources in secondary schools. The more the students are exposed to ICT resources, the more it becomes easier for teachers to use the ICTs and the students are able to use them in doing research on assignment given by teachers. The learners gain manipulative, psychomotor skills that enable them use the ICTs without fear or tension and with minimal guidance from the teacher.

However, school leadership and lack of technical support for teachers is negatively affecting ICT integration efforts. The role of school leadership in enhancing ICT integration is to allocate adequate ICT resources, empower staff and have clear school ICT policy, Integration guidelines and sponsoring teachers for in-service training in changing

modern information technologies. Teachers in setting up ICT devices, connectivity, identifying and fixing technical faults that may occur during integration in the classroom, require technical support.

5.4   Recommendations

In this section, the researcher has presented recommendation on actions to be taken based on the findings of the study.

The researcher recommends that:

i.   The Government, through Rural Electrification Authority (REA), should accelerate distribution of mains electricity to connect secondary schools in rural areas to the national grid and improve internet connectivity as major ICT infrastructure in ensuring schools e-readiness

ii. In-service training and capacity building for teachers should be continuous in order to help them acquires ICT and 21st century skills on emerging technologies. The training should focus on ICT pedagogies rather than computer skills per se.

iii. To enhance access to ICT resources, the government and other stakeholders to equip schools with adequate ICT resources and increase the number of benefiting schools per constituency. Community resource canters may also increase access and exposure to ICTs in rural areas.

iv. Students are allowed to possess and use internet enabled portable IT devices such phones, smart-phones and laptops to raise the level of students' exposure to growing digital world.

v.   The Governments to capacity build a teacher in each secondary school as an ICT mentor. This will reduce the cost of engaging an IT expert in each school.

vi. Monitoring and evaluation of ICT integration in secondary schools to be done to ensure its utilization and success.

vii. The Kenya Institute of Curriculum Development (KICD) to convert the syllabi into digital form and develop e-books to reduce on cost of publication and procurement of learning materials. This will enhance equity and access to educational resources.

viii. Do further research after two to three years to find out the impact of ICT integration on transition rates and performance in national examinations.

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APPENDICES

APPENDIX I: TRANSMITTAL LETTER

Kuvuuka, M Benson

P.o box 52, Zombe (90213)

The Respondents, Mutitu Constituency Kitui County.

Dear Sir/Madam.

REF: Data collection.

I am a postgraduate student of Nairobi University pursuing a master's degree in Project Planning and Management. I am researching on factors affecting ICT integration in teaching and learning in secondary schools in Mutito constituency, Kitui County.

I am requesting you to assist me collect data through this questionnaire. Please give your responses as per the questionnaire items and comment on the given spaces where applicable.

Do not write your name or identity on this questionnaire.

Thanks in advance.

Yours faithfully,

Kuvuuka, M Benson,

University of Nairobi.

APPENDIX II. STUDENTS QUESTIONNAIRE

Factors affecting ICT integration in teaching and learning

Introduction: This study intends to collect information on factors affecting ICT integration in teaching and learning and the information is for academic purpose. Pleases answer by ticking (√) against the most appropriate/applicable response questionnaire items or statement. To express opinion, use the provided space.

Section A: Personal Information

1. What is your gender? ( ) male   ( ). Female
2. What is your age in years? (). Below 18 (). 18 to 25 () 26 to 30 () 31 to 40 () > 40.
3. In which form/class are you? (). Form 1 (). Form 2 (). Form 3 (). Form 4.

Section B. effect of exposure to Information Communication Technology to ICT integration in teaching and learning.

4. Do you know how to operate a computer? (). Yes (). No
5. At what level of education did you train/acquire the computer and ICT skills? (). None (). Primary (). Secondary (). College (). During seminars/workshops.
6. Do you have access to any Computer or portable IT device? (). Yes (). No
7. Have you ever attended lessons in which computers are used to present the lesson? (). Yes (). No
8. Your computer knowledge has enhanced understanding of ICT integrated lessons during teaching and learning. (). Strongly agree (). Agree (). Disagree (). Strongly disagree (). Neutral
9. Which of the following ICT resources do you possess? (). Phone (). Computer (). Modem (). Laptop (). Video Camera (). Any other, specif……………….……….
10. Where do you mostly access ICT resources? (). None (). School ICT laboratory () office (). Home (). Cyber café (). Workshop/INSET canters.
11. How often do you use/access ICT resources? (). None (). Daily (). Weekly basis (). Occasionally.
12. How would you rate your current exposure to ICTs? (). Below 25% (). Between 25% - 50% (). > 50 to 75% (). Neutral.

13. How do you use your free time? (). Socialize (). Play video games   (). Surf/browse the internet revising. (). Online chatting with friends. (). Practice computer use (). Other

14. What do you think should be done to enhance ICT integration in teaching and learning? state ………………………………………

APPENDIX III: QUESTIONNAIRE FOR TEACHERS

Factors affecting ICT integration in teaching and learning

Introduction: This study intends to collect information on factors affecting ICT integration in teaching and learning and the information is for academic purpose. Pleases answer by ticking (√) against the most appropriate/applicable response questionnaire items or statement. To express opinion, use the provided space.

Section A. Personal information

1. What is your gender? () Male ( ). Female
2. What is your age in years? ( ). 18 to 25 ( ) 26 to 30 ( ) 31 to 35 ( ) 36 to 40 (). Over 40
3. What is your highest level of education? (). O level/A level (). Diploma ( ). Degree.
4. What is your teaching experience in years? (). Below 2 (). 2 to 5 (). 6 to 10 (). > 10

Section B. effect of students exposure to ICTs on integration in teaching and learning.

5. How would you rate the students in the school in terms of exposure to ICTs? (). Very high (). High (). Low (). Very low (). Neutral
6. ICT integrated lessons are easy to present to students with ICT exposure. (). Strongly agree (). Agree (). Disagree (). Strongly disagree (). Neutral
7. Students get distracted with internet and computer games during ICT integrated lessons. (). Strongly agree (). Agree (). Disagree (). Strongly disagree (). Neutral

Section C. effect of accessibility to ICT resources on ICT integration

8. Do teachers in your school have computer skills? (). Yes (). No
9. Do you use the Internet computers/ICT resources in the school? (). Yes (). No
10. I have direct access to and use of school ICT laboratory. (). Strongly agree (). Agree (). Disagree (). Strongly disagree. (). Neutral
11. Where do you access computers/ICT resources from? (). None (). Home (). At school (). Seminars/workshops centers (). Cyber café (). Community resource centers.
12. The World Wide Web and Internet connectivity is accessible in the school and offers a wide range of teaching/learning resources. (). Strongly agree (). Agree (). Disagree (). Strongly disagree.

Section D: Effect of teacher training in ICT Skills on ICT integration

13. Which subjects do you teach? State…………………………………………………

14. For how long have you been in service (teaching) in years? (). Below 1 (). 2-5 (). 5

15. How often do you prepare and present lessons in class using ICT tools? (). Very often (). Often (). Rarely (). Very rarely (). Never

16. Have you been trained on computers and ICTs? (). Yes (). No

17. Which areas have you been trained on? (Choose only two). (). Computer skills (). Software and hardware (). ICT integration skills (). ICT in education pedagogy

18. If yes in 16 above, at what level did you train? (). Primary (). Secondary (). College (). Seminars/workshops

19. For what purpose do you use computers/ICTs? (Tick all that applies to you)

   (). Access internet for t/l resources

   (). Keep database of my students

   (). Prepare and Present PowerPoint lessons

   (). Prepare professional documents

   (). Upload and download ICT contents

   (). Chatting and discussing with other teachers and friends

20. Have you ever had an in-service (INSET) training on ICT skills? (). Yes (). No

21. After attending an ICT integration seminar, how often do you prepare and present ICT integrated lessons? (). Very often (). Often (). Rarely (). Very rarely (). Never

22. Whenever there are ICT seminars, teachers are sponsored for in-service training. (). Strongly agree (). Agree (). Disagree (). Strongly disagree (). No comment.

23. The ICT skills I have acquired are adequate to enable me to prepare digital content and present lessons using ICTs. (). Strongly agree (). Agree (). Disagree (). Strongly disagree (). No comment.

24. Teachers who have computer knowledge do face challenges integrating ICT in teaching and learning. (). Strongly agree (). Agree (). Disagree (). Strongly disagree (). No comment.

25. Apart from training on computer/ICT skills, teachers need in-service training on ICT educational pedagogies. (). Strongly agree (). Agree (). Disagree (). Strongly disagree (). No comment.

26. I can do basic trouble shooting to identify simple computer failures during ICT lesson preparation and presentation. (). Strongly agree (). Agree (). Disagree (). Strongly disagree. (). Neutral.

27. Further training on ICT integration skills would enhance teaching and learning. (). Strongly agree (). Agree (). Disagree (). Strongly disagree.

Section E: Effect of leadership and technical support on ICT integration

28. Does the school have an ICT technician to offer instant technical assistance during preparation and presentation of ICT lessons? (). Yes (). No

29. Teachers can prepare and present PowerPoint lessons using ICT tools without much technical support. (). Strongly agree (). Agree (). Disagree (). Strongly disagree.

30. Setting up ICT devices for technology education in class is troublesome and time consuming without technical support. (). Strongly agree (). Agree (). Disagree (). Strongly disagree. (). Neutral

31. The Principal encourages and enforces ICT integration in teaching/learning? (). Strongly agree (). Agree (). Disagree (). Strongly disagree. (). Neutral

32. Budgets on ICT resources are received by the administrators and passed in time. (). Strongly agree (). Agree (). Disagree (). Strongly disagree. (). Neutral

33. Teachers are allowed to attend ICT workshops/seminars to enhance ICT skills. (). Strongly agree (). Agree (). Disagree (). Strongly disagree. (). Neutral

34. The school leadership make efforts are made to ensure teachers have more time needed for ICT integration. (). Strongly agree (). Agree (). Disagree (). Strongly disagree. (). Neutral

35. The school has put in place emergency source of power. (). Strongly agree (). Agree (). Disagree (). Strongly disagree. (). Neutral

36. To what extent do you agree that School ICT policy and integration guideline would enhance ICT integration in teaching and learning. (). Strongly agree (). Agree (). Disagree (). Strongly disagree.

37. ICT technical support enhances ICT integration in teaching and learning. (). Strongly agree (). Agree (). Disagree (). Strongly disagree.

38. School leadership support enhances ICT integration in teaching and learning. ().
Strongly agree (). Agree (). Disagree (). Strongly disagree.

Thank you for participating in this research.

APPENDIX IV: QUESTIONNAIRE FOR PRINCIPALS

Introduction: This study intends to collect information on factors affecting ICT integration in teaching and learning. The information will only be used for academic purpose.

Pleases answer by ticking (√) against the most appropriate/applicable response questionnaire items or statement. To express opinion, use the provided space.

Section A: personal information.

1. What is your gender? ( ) male   ( ). Female
2. What is your age in years? ( ). Below 18 ( ). 18 to 25 () 26 to 30 () 31 to 40 () > 40.
3. What is your highest level of education? (). Secondary (). Diploma (). Degree
4. For how long have you been in the school (in years)? (). Below two (). 2- 5 () 5 – 8 () above 8.

Section B: Effect of Leadership and technical support on ICT integration.

5. How many computers and ICT resources has the school received from the government? (). None (). Below 10 (). Between 10 and 25 (). Above 25.
6. Of the number supplied above, how many are still operational? (). None (). All (). Half of them.
7. Does the school have a policy on ICT and guidelines for ICT integration in teaching and learning? (). Yes (). No
8. How many ICT seminars/workshops have the school-sponsored teachers for the last two years? (). None (). Two (). More than two (). Neutral (). Not allowed to attend
9. High access to ICT resources has enhanced ICT integration in teaching and learning in this school. (). Strongly agree (). Agree (). Disagree (). Strongly disagree. (). Neutral
10. There are more teachers attending other seminars than ICT seminars/workshops. (). Strongly agree (). Agree (). Disagree (). Strongly disagree (). Neutral

11. Teachers in this school are effective in use of ICTs for integration. (). Strongly agree (). Agree (). Disagree (). Strongly disagree. (). Neutral.

12. How would you rate your students in terms of exposure to ICTs? (). Very low (). Good (). Satisfactory (). Neutral. (). Very high

13. Which of the following support staff has the school engaged? (Tick all that apply to the school) (). School cateress (). Senior cook (). Office manager (). Computer technician (). Electrician (). Others

14. Do you have alternative source of power in case of power blackout? (). Yes (). No

15. Who can access the ICT laboratory at any given time? (). Administrators only (). Students accompanied by a teacher. (). Students during free lessons (). Teachers (). ICT technician

16. What do you think is affecting ICT integration in teaching and learning? (State)…………………………….…………………………………………
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