

**SCHOOL FACTORS INFLUENCING INTEGRATION OF  
INFORMATION COMMUNICATION TECHNOLOGY IN TEACHING  
AND LEARNING IN PUBLIC SECONDARY SCHOOLS IN KILUNGU  
SUB-COUNTY, KENYA**

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the Requirements for Award of the Degree of Master of Education in  
Curriculum Studies**

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## **DECLARATION**

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

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This research project has been submitted for examination with our approval as university supervisors.

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## **DEDICATION**

I dedicate this work to my dear wife Catherine Mutheu Thomas, my children Albert Mwangangi, Matilda Mumbua and Adrian Muuo. To memory of my father late Josiah Mwangangi and my mother Brigitta Nthambi for their moral support during the research.

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## **ABBREVIATIONS AND ACRONYMS**

CD ROM	Compact Disc Read Only Memory
GIS	Geographical Information Systems
ICT	Information Communication Technology
KICD	Kenya Institute of Curriculum Development
NCSTI	National Commission for Science, Technology and Innovation
SPSS	Statistical Package for Social Sciences
SMASE	Strengthening Mathematics and Science Education

## **ABSTRACT**

The purpose of the study was to establish school factors influencing integration of ICT in teaching and learning in secondary schools in Kilungu Sub-county Kenya. A descriptive survey research design was used in this study. The study sought to determine how teacher characteristics influence Information Communication Technology integration in teaching and learning in secondary schools in Kilungu Sub-county, establish how technical support influence integration of Information Communication Technology in teaching and learning in secondary schools in Kilungu Sub-county, determine influence of technological characteristics on integration of Information Communication Technology in teaching and learning in secondary schools in Kilungu Sub-county and assess the extent to which a teacher's pedagogical strategies influence Information Communication Technology in integration in teaching and learning in secondary schools in Kilungu Sub-county. The study targeted 22 public secondary schools in Kilungu Sub-county, Makueni County, Kenya. Census sampling was adopted where all the 22 public schools and principals were sampled. Random sampling was applied in sampling the 110 teachers and 264 students. A questionnaire was used to collect data from the target population. The researcher used an observation schedule to collect data on available ICT equipment and evidence of ICT integrated lessons going on in the schools. The collected data were analysed using both qualitative and quantitative data analysis methods. The findings of the study were; half of the principals and teachers 50% had low training in ICT integration. This negatively influenced ICT integration in teaching and learning. Majority 64% of the schools did not have ICT infrastructure. This hindered ICT integration in teaching and learning. Technological characteristics affected ICT integration in teaching and learning in a negative way, since only 5% of the teachers used projectors due to complexity of the software and hardware. Further, it was found out that pedagogical strategy adopted by the teacher had an influence on ICT integration, teachers who preferred traditional teacher centred methods of teaching, for example, the lecture method were less likely to integrate ICT in teaching and learning. In Kilungu sub-county, half of the teachers 50% used the lecture method in teaching, meaning that they were not integrating ICT in teaching and learning. The conclusions of the study were that the ability to integrate ICT in teaching and learning was highly influenced by teacher characteristics, that lack of ICT technical support to schools prevents the integration of ICT in teaching and learning and that teachers pedagogical strategies negatively influence ICT integration in teaching and learning. The study recommended that the government increase the number of the computers in the schools and prioritize in-service training for teachers in ICT integration. The government should build computer labs in the schools that do not have them. Again the government should employ ICT technical assistants in all the schools to help teachers integrate ICT in teaching and learning.

# **CHAPTER ONE**

## **INTRODUCTION**

### **1.1 Background to the Study**

The rapid growth in information communication Technologies (ICT) have brought remarkable changes in the twenty-first century as well as affected the demands of modern societies. Information Communication Technology (ICT) is becoming increasingly important in our daily lives and in our educational system. Therefore, there is a growing demand on educational institutions to use ICT to teach the skills and knowledge which students need for the 21<sup>st</sup> century (Gulbahar, 2007).

Earle (2002) linked ICT integration with the concept of wholeness, where all elements of the system are connected together to become a whole. For instance, the two important elements of teaching and learning which are content and pedagogy must be joined when technology is used in a lesson. Williams (2003) described ICT integration as the means of using any ICT tool (Internet, E-learning technologies, CD Roms, extra) to assist teaching and learning.

Historically, the concept of ICT integration as an approach to teaching and learning came about as a reaction to early computer-in-schools programmes where the emphasis lay on developing computer literacy or technical knowledge of computers and the use of various computer applications (Wilson-Strydom, 2005). More recently ICT integration has been recognized

as using computers to learn, rather than learning to use computers (UNESCO/COL, 2004). The integrated approach places information technology in a pivotal role in transforming the learning process. According to UNESCO (2004) the success of ICT integration lies with the ability of teachers to set tasks that require learners to use information skills. Worldwide research has shown that ICT can lead to improved student learning and better teaching methods. A report made by the National Institute of Multimedia Education in Japan, proved that an increase in student exposure to educational ICT through curriculum integration had a significant and positive impact on students achievement, especially in terms of knowledge, comprehension, practical skills and presentation skills in subject areas such as mathematics, science and social studies (Wozney & Venkatesh, 2006).

Global investment in ICT to improve teaching and learning in schools have been initiated by many governments. Countries like Britain, the United States of America and New Zealand spend huge amounts of money yearly on schools' ICT infrastructure (Johnson, 2009). Since 2010 Kenya has spent more than 1.5 billion shillings in setting up of ICT infrastructure and training teachers on ICT use in public secondary schools (MOEST, 2012). Despite all these investments on ICT infrastructure, equipment and professional development to improve education in many countries the huge educational investment have produced little evidence of ICT adoption and use in teaching and learning (Gulbahar, 2007).

Khalid (2007) investigated some of the factors that influence teachers' integration of computer technology among English language teachers. As a case study, it involved 13 English language teachers from 5 primary schools in Satok area in Kuching, Malaysia. Findings revealed that 77% of the teacher-respondents were not integrating computing for teaching. As such, lack of training and confidence in computer use, lack of technology assistance and time factors were identified as the main reasons for not integrating computer technology in teaching and learning.

In the Philippine, Correos (2014) found that the secondary school English language teachers' possessed moderate ICT literacy skills. The findings provided evidence that there was only a limited use of ICT in language teaching. Feedback gathered from questionnaires showed that teachers faced many challenges that demotivate them from using ICT in language activities. Based on these findings, it was recommended the teachers must be provided with intensive ICT-based trainings to equip them with knowledge of ICT and its utilization in language teaching.

According to an evaluation report of Intel® innovation in education Teach to the Future Programme launched in South Africa in 2000 and aimed at helping teachers integrate technology in their classrooms in order to enhance students learning, teachers were found not to be integrating technology in teaching and learning. A survey conducted online targeting a total of 1078 educators in South Africa who had completed the Intel® Teach to the Future Training

showed that in terms of access to computers for teaching and learning 93% of respondents had access to computers while 7% of the respondents indicated they did not. In the survey teachers were asked the frequency of ICT integration in their lessons. The most striking find was that the teachers who reported to have implemented technology integrated lessons about once per month (58%) or less than once per month (57%) had between 11-20 computers only. Yet, 33% of the teachers reported that they had never used technology integrated lessons even though they had more than 21 computers. The conclusion of this study was that increased access to computers alone did not necessary translate to increased implementation of technology integrated lessons (UNESCO, 2004).

Studies carried out in Kenya show that there is no meaningful ICT integration in teaching and learning (Goko, 2012). These observations bring to fore the inherent contradiction in ICT integration in Education. Kombo (2013) reported that despite the Kenya government's effort and willingness to promote ICT as an instructional tool, progress on ICT front had fallen short of expectations. He further reports that the Ministry of Education strategic plan for 2008-2012 identifies slow integration of ICT in operation and programmes as an area of major weakness in the ministry.

According to the centre for Mathematics, Science and Technology in Africa (CEMASTEA) Nzai, Mukaa and Kilungu District Planning Committee (DPC) report submitted to the County Director of Education (2015) Makueni



County, very few schools were integrating ICT in teaching and learning in the three Sub-counties. The report noted that ICT integration in teaching Science and Mathematics has been one of the training modules in all Strengthening Mathematics and Science Education (SMASE) in service courses which all the Science and Mathematics Teachers have been subjected to. The government has spent considerable amount of money in setting up comprehensive ICT infrastructure in public schools in Kilungu Sub-county (SCDE-Kilungu Sub-county 2015). However like many studies have shown elsewhere the provision of comprehensive ICT infrastructure may not necessary translate into ICT integration in teaching and learning. This study sought to establish whether public schools in Kilungu Sub-county were applying ICT tools to improve teaching and learning outcomes

## **1.2 Statement of the problem.**

The government has been looking for ways in which information and communication technology (ICT) can be leveraged to support and improve the delivery of quality education for all Kenyans. To this end the government has developed National ICT strategy for education and training. A national ICT policy was promulgated in January 2006. A lot has been done in improving ICT integration in education like the provision of ICT equipment in schools through the economic stimulus programme and other donor funded initiatives, the digitization of the curriculum by the Kenya Institute of Curriculum Development, provision of electricity and other sources of power to schools. However there is concern that the much anticipated potential of ICT to offer

cost effective solutions to issues of quality, equity and access to education may not come to fruition if the teachers and the institutions will not integrate the new technology in classroom. According to a SMASE District Planning Committee (DPC) report for Kilungu, Mukaa and Nzau Sub-counties (2015), schools in the three Sub-counties have not been integrating ICT in teaching and learning. According to the Sub-county Director of Education, Kilungu Sub-county and quality assurance reports, 8 schools have been funded through the economic stimulus project to purchase comprehensive ICT equipment. The remaining 14 schools have at least three computers SCDE Kilungu (2015). However schools assessment reports show that these ICT equipments are not being used in ICT integration. There is no known study to the researcher that has been carried out in Kilungu Sub-county to establish whether schools are applying ICT tools in teaching and learning. The study was intended to find out what school factors influence ICT use in Kilungu Sub-county.

### **1.3 Purpose of the study**

The purpose of this study was to establish school factors influencing integration of ICT in teaching and learning in Secondary schools in Kilungu Sub-county of Makueni County, Kenya.

#### **1.4 Objectives of the study**

The research objectives of the study were:-

- (i) To determine how teacher characteristics influence Integration of Information Communication Technology in teaching and learning in secondary schools in Kilungu Sub-county.
- (ii) To establish how technical support provided to teachers influence integration of Information Communication Technology in teaching and learning in secondary schools in Kilungu Sub-county.
- (iii) To determine if technological characteristics influence integration of Information Communication Technology in teaching and learning in secondary schools in Kilungu Sub-county.
- (iv) To assess the extent to which a teacher's pedagogical strategies influence Information Communication Technology integration in teaching and learning in Secondary schools in Kilungu Sub- County.

#### **1.5 Research Questions**

In order to achieve the research objectives, the research endeavored to answer the following questions:-

- (i) How do teachers' personal characteristics influence ICT integration in teaching and learning in Secondary schools in Kilungu Sub-county?
- (ii) To what extent does ICT technical support to teachers influence ICT integration in teaching and learning in secondary schools in Kilungu Sub-county.

- (iii) What is the influence of technological characteristics in ICT integration in teaching and learning in Secondary schools in Kilungu Sub-county?
- (iv) How do teacher's pedagogical strategies influence ICT integration in teaching and learning in secondary schools in Kilungu Sub-county?

### **1.6 Significance of the study**

It is hoped the findings of this study may provide useful information on ICT integration that can be used by secondary school administrators and teachers in making pertinent decision in ICT integration in teaching and learning at school level. Local and international donors and other non-state actors may use the study findings as a point of reference in determining priority areas for funding in ICT integration in teaching and learning. In matters of scholarship this study may contribute information that can be used to compare with other research findings of studies carried elsewhere on school factors influencing ICT integration in teaching and learning.

### **1.7 Limitations of the study**

The ICT sector is highly dynamic and could change within a short time span making the findings of this study obsolete. In order to mitigate this challenge the researcher has recommended further research on diverse aspects of the research variables. Again, respondents may not give accurate responses for fear that such responses may bring out weakness on their part and questioning of their integrity. The researcher assured the respondents that the study was

purely for academic purposes and was in no way intended to bring out real or perceived weakness in ICT integration in the sampled schools.

### **1.8 Delimitation of the study**

The study delimited itself to integration of ICT in public secondary schools in Kilungu Sub-county. This is because the government had spent a lot of resources in these schools in setting up ICT infrastructure Ministry of Education, (2012). Many factors of interest in ICT integration have been identified. However, this study limited itself to teachers' personal characteristics, technical support, technological characteristics and teacher pedagogical strategies. This is because the researcher felt that these factors may have significant influence in teaching and learning in Kilungu Sub-county. Researching more factors would have required more time and extra resources. Again the researcher felt the said variables were of significance in the identified locale of the study. The study respondents were delimited to 22 public schools principals, 110 teachers and 264 students. Although they are private schools in Kilungu Sub-county the researcher felt including them would have unnecessarily stretched the researcher's resources. Furthermore no public resources had been spent in setting up ICT infrastructure in the private schools.

## **1.9 Basic assumptions of the study**

The researcher assumed:

- i) The participants would answer the interview questions in an honest and candid manner.
- ii) The inclusion criteria of the sample were appropriate and therefore, assured that the participants had all experienced the same or similar phenomenon of the study.
- iii) Participants had a sincere interest in participating in the research and had no fear in providing required information.

## **1.10 Definition of significant terms**

These terms have been defined according to the context of use in this study.

**Teacher Characteristic** In this context teacher characteristic refers to teachers' attitudes, ICT competence and gender.

**ICT infrastructure** refers to computers, computer hardware and software, computer labs, mobile phones and other hand held.

**ICT integration** refers to ICT functioning as an integral or mediated tool to accomplish specific teaching or learning activities to meet certain instructional objectives.

**ICT technical support** refers to use of ICT coordinators, champions or assistants in schools in assisting teachers to integrate ICT in teaching and learning and overcoming software and hardware challenges.

**Pedagogical strategy** refer to a teaching method or approach

**Technological characteristics** refers to attributes, compatibility, complexity, triabilty and ease of use of the computer hardware and software.

### **1.11. Organization of the study**

The study is organized into five chapters. Chapter one is the introduction which consists of the background of the study, statement of the problem, purpose, objectives of the study, research questions, significance of the study, limitations and delimitations of the study, basic assumptions of the study and definition of significant terms. Chapter two is an exploration of literature review on the identified variables of the study: teacher characteristics, technical support, technological characteristics and pedagogical strategy. A summary of the related literature, theoretical framework and conceptual framework for the study are also included. Chapter three is the research methodology which includes an introduction, research design, target population, sample size and sampling procedure, research instruments, validity and reliability of the research instruments, data collection procedures and analysis techniques. Chapter four includes: data presentation, analysis and interpretation. Chapter five is a summary of the findings, conclusion and recommendation for further study.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

This chapter discusses the literature related to the factors influencing ICT integration in teaching and learning in secondary schools. These factors are: teachers' personal characteristics, ICT technical support, technological characteristics and teachers' choice of pedagogical strategy. In these chapter also there is Summary of the literature review, theoretical framework and conceptual framework.

#### **2.2 Information Communication Technology integration in teaching and learning.**

Information Communication Technology basically refers to the use of technology in communication, data processing and data storage to impart knowledge on learners. The benefits of ICT seem suitable for coping with the issue of basic literacy and technological literacy, even among the poorest population sectors, computer based learning (CBL) and teaching makes learning more efficient and more interesting to learners thus improving the quality of education (Tinio, 2002). ICT offers increased possibilities for codification of knowledge about teaching and for innovation in teaching activities through being able to deliver learning and cognitive activities anytime and anywhere. ICT is considered at present as a potential tool that provides educational opportunities in both formal and non-formal ways. In the teaching-learning process, ICTs can increase learners' motivation and



engagement in classroom learning. It equips learners with digital age literacy, inventive thinking, higher-order thinking and sound reasoning, effective communication, and high productivity (Tinio 2002).

The Internet and the rise of computer-mediated communication have reshaped the use of computers for teaching and learning. The shift to global information-based economies means that students will need to learn how to deal with large amounts of information and should be able to communicate across languages and cultures. At the same time, the role of the teacher has changed as well. Teachers are not the only source of information any more, but effectively act as facilitators so that students can actively interpret and organize the information they are given, fitting it into prior knowledge (Dole, Duffy, Roeler, & Pearson 1991). Students have become active participants in learning and are encouraged to be explorers and creators of knowledge rather than passive recipients of it (Brown, 1991). The adoption of ICTs in education has continued to pose challenges both globally and locally (Hodgkinson-Williams, 2005). The need to overcome these challenges has resulted in several researches being conducted and valuable research findings on various variables that influenced ICT integration at the school level have been documented. In this literature review the researcher explores literature on school factors influencing ICT integration in teaching and learning.

### **2.3 Teachers' personal characteristics and ICT integration.**

Personal characteristics such as educational level, age, gender, educational experience, experience with computer for educational purpose and attitude

towards computers can influence the adoption of technology (Schiller, 2003). The attitudes of teachers towards technology greatly influence their adoption and integration of ICT in teaching and learning.

Successful implementation of educational technology in schools programme depends strongly on teachers support and attitudes. It is believed that if teachers perceived technology programmes as neither fulfilling their needs or their students' needs, it is likely that they will not integrate the technology in to their teaching and learning to teach the skills and knowledge students need for the 21<sup>st</sup> century (Schiller, 2003). Demirci (2009) conducted a study on teachers' attitudes towards the use of Geographic information systems (GIS) in Turkey. The study used questionnaires to collect data from 79 geography teachers teaching in 55 different high schools. The study revealed that though barriers such as lack of hardware and software existed, teachers positive attitudes towards GIS was an important determinant to successful integration of GIS into geography lessons.

In European school net (2010) survey on teacher's use of Acer netbooks involving six European Union countries, a large number of participants believed that the use of netbook had a positive impact on their learning, promoted individualized learning and helped to lengthen study beyond school day. However, evidence suggests that small number of teachers believe that the benefits of ICT are not clearly seen. A survey of UK teachers also revealed that teachers' positivity about the possible contributions of ICT was moderated

as they became 'rather more ambivalent and sometimes doubtful about specific, current advantages', (Becta, 2008).

Computer competence is defined as being able to handle a wide range of varying computer applications for various purposes (Bordbar, 2010). Teachers' computer competence is a major predictor of integrating ICT in teaching. Evidence suggests that majority of teachers who reported negative or neutral attitude towards the integration of ICT in teaching and learning processes lacked knowledge and skills that would allow them to make 'informed decision' (Bordbar, 2010).

According to (Peralta & Costa, 2007), teachers with more experience with computers have greater confidence in their ability to use them effectively. Jones (2004) reported that teachers competence relate directly to their confidence. Teachers' confidence also relate to their perceptions of their ability to use computers in the classroom, particularly in relation to their students perceived competence. Newhouse (2002) found that many teachers lacked knowledge and skills to use computers and were not enthusiastic about the changes and integration of supplementary learning associated with bringing computers into their teaching practice. In the developing countries research reported that teachers lack of technological competence is a main barrier to their acceptance and adoption of ICT (Pelgrum, 2005). In Syria teachers lack of technological competence has been cited as the main barrier (Albirini, 2006). Lack of teacher competence may be one of the strong barriers

to the integration of technologies into education. It may be also one of the factors involved into resistance to change (Pelgrum, 2005).

Gender differences and use of ICT have been reported in several studies. However, studies concerning teacher's gender and ICT use have cited female teachers' low levels of computer use due to their limited technology access, skill and interest (Volman & Van Eck, 2001). Studies have revealed that male teachers use more ICT in their teaching and learning processes than their female counterparts (Kay, 2006; Wozney, 2006). Jamieson-Proctor, Burnet, Finger and Watson (2006) conducted a study on teachers' integration of ICT in schools in Queensland State. Results from 929 teachers indicated that female teachers were integrating technology in to their teaching less than the male teachers. The situation was different in mid-west US basic schools where (Breisser, 2006) found that female's self-perceptions about technology competence improved while male's self-perceptions about technological dominance remained unchanged in a lego-logo project. The study was in agreement with (Adams, 2002) that female teachers applied ICT more than the male teachers.

Many studies have revealed that workloads of teachers influence their acceptance of technology in classrooms. For example, Samarawickrema & Stacey (2007) investigated factors related to the use of learning management system in a large multi-campus urban university in Australia. They adopted case study method and purposive sampling to select 22 participants and used web based methods to teach both on and off campus students for the study.

The findings of the research found that increased workload coupled with teaching with technology was critical to the participants of the study. Factors reported to contribute to increased workload were course, maintenance and constant upgrades, student emails, the learning of new skills and the continuous search of sustainable strategies.

According to Fullan (2003), for teachers to realize the aims of educational system as well as implementing new initiatives, it is necessary to lessen the workload of teachers. It is evident that teachers' characteristics have an influence on ICT integration in teaching in learning.

#### **2.4 ICT Technical support and ICT integration in teaching and learning.**

Without both good technical support and whole school resources, teachers cannot be expected to overcome the barriers preventing them from using ICT (Lewis, 2003). In a study carried out by (Pelgrum W., 2001) it was found out that one of the top barriers in ICT use in education was lack of technical assistance.

In Sicilia's (2005) study, technical problems were found to be major barriers for teachers. These technical barriers included waiting for websites to open, failing to connect to the internet, printers not printing, malfunctioning computers and teachers having to work on old computers. Sicilia concluded that technical barriers impeded the smooth delivery of the lesson or classroom activity. ICT support or maintenance contracts in school help teachers to use

ICT in teaching without losing time through having to fix software and hardware problems (Korte and Husing, 2007).

In science teaching, several studies indicated that lack of technical support is a main barrier to using technologies. According to Gomes (2005) ICT integration in science teaching needs a technician and if one is not available the lack of technical support can be an obstacle. A study in Turkey found that the lack of technical support was one of the two significant barriers to the integration of ICT into science education in schools and might be considered “serious” (Gomes, 2005).

The breakdown of a computer causes interruption and if there is lack of technical assistance, then it is likely that the regular repairs of the Computer will not will not be carried out resulting in teachers not using computers in teaching. The effect is that teachers will be discouraged from using computers because of fear of equipment failure since no one would give them technical support in case there is technical problem (Jones, 2004).

In assessing the technology integration processes in the Turkish education system it was reported that in providing schools with hardware and internet connections, it is crucial to provide the schools with technical support with regard to repair and maintenance for the continued use of ICT in schools (Yilmaz, 2011). Even though lack of technical support discourages teachers from adopting and integrating technology in classrooms, a study by (Korte & Husing, 2007) revealed that schools in Britain and the Netherlands have

appreciated the significance of technical support to help teachers to integrate technology in to their teaching. They argued that ICT support in schools influence teachers to apply ICT in classrooms because they will not waste time in troubleshooting hardware and software problems.

### **2.5 Influence of technological Characteristics and integration of ICT in teaching and learning.**

Technology characteristics influence the diffusion processes of an innovation and are significant factors impacting an innovation adoption. Evidence suggests that innovation attributes; relative advantage, compatibility, complexity, trialability and observability as perceived by individuals influence the rate of adoption (Rogers, 2003). Understanding educators' perceptions of innovation is a key determinant to successful adoption of technology in learning, which according to (Watson, 2006) is a particular kind of instructive innovation. Groff & Mouza (2008) assert that when teachers integrate ICT in to teaching, they operate as innovators.

A study by (Smarkola, 2007) confirmed that perceived usefulness and perceived ease of use were predictors of user acceptance of computer technology. A study that investigated 700 Nigerian secondary school teachers uses of ICTs and implication for further development of ICT use in schools, found that most teachers perceived ICT as very useful and as making teaching and learning easier (Ajayi L. (2009).

Another study in Turkey examined the extent to which perceived innovation and characteristics are associated with the probability of task related ICT use among secondary school teachers. The findings showed that complexity or ease of use was a common perceived innovation characteristic for teaching delivery, preparation and managerial tasks in schools (Gulbahar, 2007).

Innovations that offer advantages, compatibility with the existing practices and beliefs, low complexity, potential trialability and Observability will have a more wide spread and rapid rate of integration (Askar & Bas, 2008).

## **2.6 Pedagogical strategy and integration of ICT in teaching.**

Research studies in education have shown that information and communication technologies (ICT) coupled with necessary pedagogical strategies engage students in higher-order thinking (Lim, 2007). The primary motivation for integrating ICT in education is the belief that it supports students in their own constructive thinking, allows them to transcend their cognitive operations that may not have been capable otherwise (Lim, 2007).

An earlier research into pedagogy and ICT was carried out by Moseley and Higgins (1999) the research focused upon the teaching of numeracy and literacy in primary schools using ICT. The research drew upon school improvement methodologies and made use of a model of teaching and learning. The model regards pedagogy as being about teachers' behaviours in the classroom. An important factor determining teachers' behaviour is pedagogical content knowledge, which is defined as the blending of content



and pedagogy into an understanding of how particular topics, problems or issues are organized, represented and adapted to the diverse interests and abilities of learners, and presented for instruction.

## **2.7 Summary of the literature review**

The review highlighted on factors that positively or negatively influenced teachers' use of ICT. These are personal, ICT technical support, technological and pedagogical factors. It has been shown that these factors are related.

On personal level it has been shown that a number of factors influence teacher use of ICT. Teachers' attitude, ICT competence, Gender, and teacher workload. From the literature review, it seems gender is not a strong predictor of use of ICT in teaching and learning by teachers. However, teacher workload seems to have considerable influence on ICT integration in teaching and learning.

On ICT technical support, from the literature it has been shown that teachers need technical support to successfully integrate ICT in teaching and learning.

On the technological level for successful adoption and integration of ICT into teaching and learning teachers' must perceive the technology as better than previous practice; consistent with their existing values, past experiences and needs. It must also be easy to try and use.

On the pedagogical level it has been demonstrated that teachers' who embrace constructivism teaching theories are more likely to integrate ICT into teaching

and learning. Questions have been asked as to whether the available ICT materials are adequate and being used. Again this study examines the impact of ICT integration in curriculum implementation and delivery.

## **2.8 Theoretical Framework**

This study made use of constructivist learning theory. At its simplest, constructivism states that knowledge is constructed; that is individuals make sense of their world by constructing their own representations or models of their experiences (Jonassen, Peck & Wilson, 1999). Constructivism is founded on the work of individuals such as Piaget, Dewey Vygotsky, Ernst Von Glasserfeld, Kant and Rohn. Constructivism is based on four central beliefs that new knowledge is built on the foundation of previous learning. That learning is an active rather than a passive process. That language is an important aspect of the learning process; and that learning environments should be learner-centred (Kanuka & Anderson 1999).

Information Communication Technology enhances constructivist classroom practices; require teachers to play a new role. The role of the teacher change from knowledge transmitter to that of learning facilitator, knowledge guide, knowledge navigator and co-learner with the student. Students will have greater responsibility for their own learning in this environment as they seek out, find, synthesize, and share their knowledge with others (Kanuka & Anderson 1999).

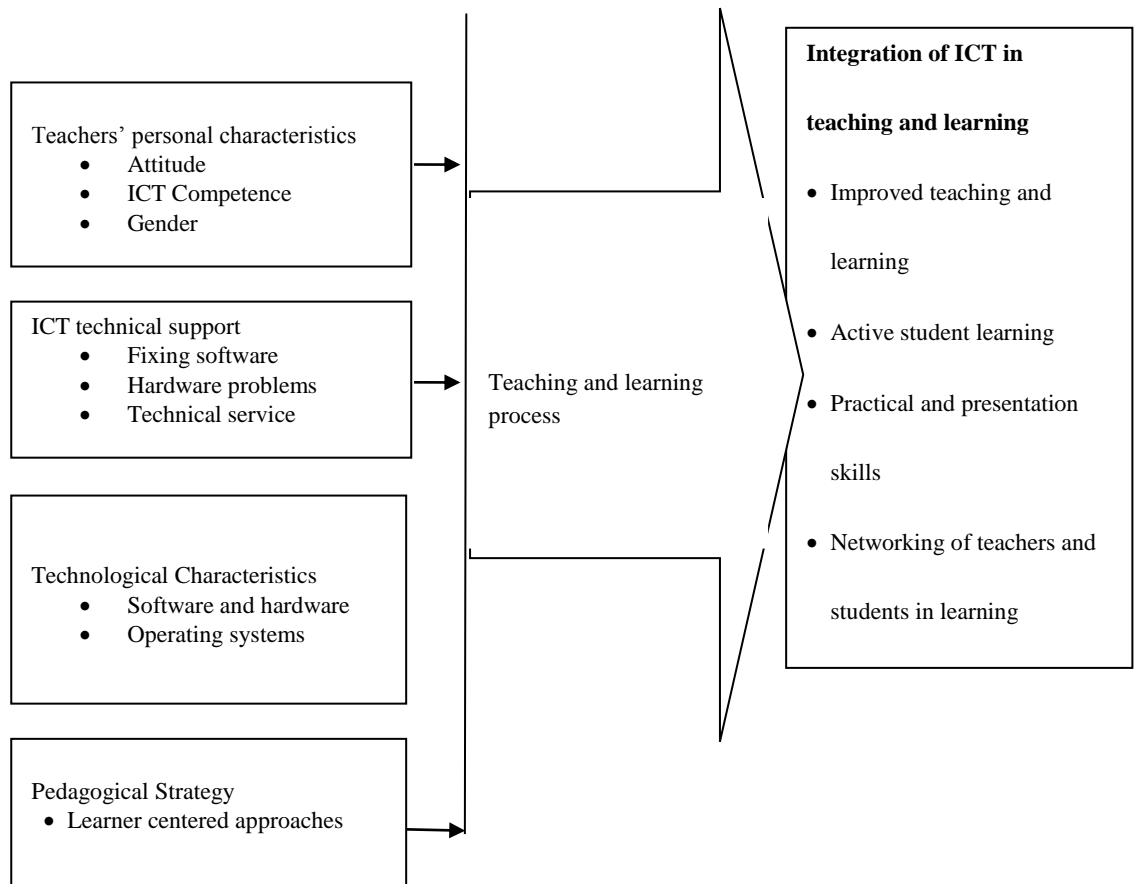
Information Communication Technology integration in teaching and learning fits in well with the theory of constructivism. In ICT integration the role of the teacher has changed. Teachers are not the only source of information any more, but effectively act as facilitators so that students can actively interpret and organise the information they are given fitting it into prior knowledge (Dole, Duffy, Roeler & Pearson 1991). Students have become active participants in learning and are encouraged to be explorers and creators of knowledge rather than passive recipients of it. Constructivism approach to teaching and learning calls for change of teachers' attitudes so that they can appreciate their new role which radically departs from the traditional approach to teaching and learning where the teacher is the sole custodian of knowledge. Training to improve teachers' competence in ICT integration is paramount so that they can handle their new roles with confidence.

Constructivism calls for learner centred pedagogical strategies where teachers become facilitators and students have greater latitude in all they learn. ICT integration in teaching and learning affords this opportunity to teachers and learners. Research has shown where effective ICT integration has been implemented there have been better learning outcomes and improved teaching and learning. Students are active and gain important practical and presentation skills. There is more meaningful networking of teachers and students in learning and all these lead to high achievements

## 2.9 Conceptual framework

This conceptual framework has been used to illustrate what the researcher expects to find through the research. It shows the variables and how they relate to each other.

..



**Figure 2.1 School factors influencing ICT integration**

ICT integration in teaching and learning is influenced by such factors as teacher's personal characteristics, ICT technical support, technological characteristics and pedagogical strategies employed by the teachers. These are the independent variables. In order to realize the benefits of ICT integration in

teaching and learning teachers need to be trained in order to change their attitudes and make them more competent in use of ICT resources in improving the classroom experiences. Again it is necessary to provide teachers with ICT technical assistants to help them in handling technical issues in ICT integration. This will provide the much required confidence to enable the teachers integrate ICT in teaching and learning. It is also pertinent for the teachers to embrace learner centred pedagogical strategies which lend themselves more readily to ICT integration. Provision of sufficient and accessible digital resources is paramount to effective ICT integration in teaching and learning. The hardware and software used should be user friendly and compatible. If all this is done it will lead to improved teaching and learning, active students learning, acquisition of practical and presentation skills by students, networking of teachers and students in learning resulting to collaborative learning leading to high students achievement.

## **CHAPTER THREE**

### **RESEARCH METHODOLOGY**

#### **3.1 Introduction**

Chapter three consists of research design, target population, sample size and sampling techniques, research instruments, data collection procedures, instruments validity, instruments reliability and data analysis techniques.

#### **3.2 Research Design**

The study utilized the descriptive survey design (Borg & Gall, 1995). The researcher preferred descriptive survey research design because the research is intended to produce statistical information about factors influencing integration of ICT in public secondary schools. Lockesh (1984) explains that descriptive survey studies are designed to obtain pertinent and precise information concerning the correct status of phenomenon and where possible to draw valid general conclusions from the facts obtained. This design is suitable for this study because it will enable the gathering of information of the situation as it is on the ground. Again, it will help in describing ICT integration in teaching and learning in Kilungu Sub-county. The descriptive survey design will allow quick comparisons and make inferences on the school factors influencing ICT integration in teaching and learning since it will describe the situation as it is in the schools.

### **3.3 Target Population**

Kilungu Sub-county has 22 public secondary schools. The target population for this study was the 22 public secondary schools, 22 principals, 179 teachers in the schools and 2,640 Form Three and Four students in the 22 schools (Sub-county Director of Education Kilungu, 2015)

### **3.4 Sample Size and Sampling Procedure**

According to Mugenda and Mugenda (2004), depending on the prevailing circumstance researchers have an option of sampling procedures from which they can opt to represent accurately the phenomenon under investigation. This study used census sampling where all the schools and principals were sampled.

Simple random sampling was used to sample the teachers. One teacher was sampled in each of the 5 departments. Therefore for each school a total of five teachers were sampled to represent five departments: mathematics, language, sciences, humanities and technical subjects. The number of teachers sampled was 110 teachers. This was 62.5% of the total teacher population in the Sub-county. Twelve students were randomly sampled in each school. Six boys and six girls were chosen giving 264 students. These constituted 10% of the total student population in the Sub-county. Kombo and Tromp (2006) proposed that a sample size of at least 10% of the target population is representative.

### **3.5 Research Instruments**

The study used questionnaire for the heads of the institutions, teachers and students. Kiess and Bloomquist (1985) observe that a questionnaire offers considerable advantage in the administration; it presents even stimulus potentially to large numbers of people simultaneously and provides investigation with an easy accumulation of data. The questionnaire was developed by the researcher and had two sections each. Section A gathered personal information while section B was based on factors influencing ICT integration in teaching and learning in secondary schools in Kilungu Sub-county. The questions were structured in both close-ended format to elicit certain responses and open-ended format to leave room for the respondents to add additional information that was of importance to the study yet not captured by the researcher.

The study also made use of an observation schedule. This helped in collaborating information obtained through the questionnaires. It captured the number of computers in the school and where ICT integrated lessons were evident.

### **3.6 Validity of the instruments**

Kombo and Tromp (2006) define validity as a measure of how well a test measures what it is supposed to measure. To establish validity of the questionnaires pre-testing through pilot method was done. Wilkinson (1991) states that a pilot study helps to identify those items that could be



misunderstood and such items should be modified accordingly thus increasing face validity. A pilot study was done in two schools in neighboring Mukaa Sub-county. The two schools were chosen since they had been identified as ICT centres in Mukaa Sub-county. All the teachers in the two schools were sampled for the pilot study to give a total of 51 teachers. The number of students sampled for the pilot study was 24. To ensure content validity questions for the questionnaire and observation schedule were derived from the study objectives.

### **3.7 Reliability of the instruments**

Reliability is the degree to which a research instrument yields consistent results after repeated tests (Mugenda & Mugenda, 2003). The test-retest technique was used in determining the reliability of the research instruments. The test-retest is the technique of applying the same test twice to the same group Mugenda & Mugenda (2003). If the results of the two tests are highly inconsistent then reliability is low. The reliability of the instruments was based on estimates of the principals, subject teachers' and students responding to the items. This yielded a coefficient of reliability using Pearson product moment of correlation.

The formula for Pearson product moment correlation is

$$r_{xy} = \frac{\Sigma(x-\bar{x})(y-\bar{y})}{\sqrt{[\Sigma(x-\bar{x})^2][\Sigma(y-\bar{y})^2]}}$$

Where  $x$  = score of one person in test 1

$\bar{x}$  = Mean score of all persons in test 1

$y$  = Score of one person in test 2

$\bar{y}$  = Mean of the second test

The value of  $r_{xy}$  must be  $\leq 1$  for the questionnaire to be accepted as reliable.

A correlation coefficient of 0.78 was obtained and the questionnaire judged reliable for the study.

### **3.8 Procedure of data collection**

Once the research proposal had been approved, the researcher first obtained a research permit from the National Commission for Science, Technology and Innovation (NACOSTI). Upon being granted the permission to carry out the research study, the researcher reported to Kilungu Sub-county Director of Education for briefing and then proceeded to selected secondary schools with a letter of introduction and the research permit. The researcher obtained permission from the principals in order to access the respondents. The researcher personally administered the questionnaires to the principals, teachers and students. The researcher left the questionnaires with the respondents and collected them after a period of five days. The researcher also gathered data on ICT infrastructure available in the schools and actual technology lessons on progress using the observation schedule.

### **3.9 Data analysis techniques**

The data collected from the field was cleaned, organized, coded and recorded. The data was collected by use of questionnaires, closed-ended questions was coded and analysed by use of the statistical package for social sciences (SPSS). Open- ended items from each questionnaire were arranged and grouped according to research questions. The responses received were arranged to generate data which was organized to address the research questions. Qualitative data was analysed by discerning, examining, comparing and contrasting and interpreting meaningful patterns and trends of the variables to show relationship between the variables. For example availability of ICT infrastructure and its use. Qualitative data such as the number of years teachers had been using computers, teachers workload, time taken to search education materials on the web, computer students ratio, the number of computers in the school connected to the internet and the number of computers in the school were analysed to show the effect of school factors on integration of ICT in teaching and learning.

The data was then presented using frequency tables, pie charts and bar graphs. Qualitative measures of dependence and relationship between the variables was explained.

### **3.10 Summary**

In the research methodology, a description of the procedure followed in undertaking the study by the researcher has been described. It details the research design which includes the target population, sample size and sampling procedure, research instruments used, validity of the instruments, reliability of the instruments, procedure of data collection and data analysis techniques.

## **CHAPTER FOUR**

### **DATA ANALYSIS, PRESENTATION AND INTERPRETATION**

#### **4.1 Introduction**

The purpose of this study was to assess the school factors influencing integration of ICT in teaching and learning in public secondary schools in Kilungu Sub-county. The research objectives of the study were: to determine how teacher characteristics influence Information Communication Technology integration in teaching and learning in secondary schools in Kilungu Sub-county, to establish how technical support influence the integration of Information Communication Technology in teaching and learning in secondary schools in Kilungu Sub-county. To determine influence of technological characteristics on integration of Information Communication Technology in teaching and learning in secondary schools in Kilungu Sub-county and to assess the extent to which a teacher's pedagogical strategies influence Information Communication Technology integration in teaching and learning in Secondary schools in Kilungu Sub- County.

#### **4.2 Questionnaire Return Rate**

Questionnaire return rate is the proportion of questionnaires that are returned to the researcher from the sample. Two principals did not return their questionnaires making the return rate for the principals 90.9%. Ten teachers did not return the questionnaires making the return rate 94.41%. For the students 19 students did not return the questionnaires making the return rate 92.8%.

### 4.3 Demographic Information of the Respondents

All the respondents were asked to state their gender. This was because the researcher wanted to find out the relationship between use of ICT in teaching and learning and the gender of the respondents. Their responses are shown in Table 4.1.

**Table 4.1**

#### **Gender of the respondents**

	<b>Principals</b>		<b>Teachers</b>		<b>Students</b>	
	<b>Frequency</b>	<b>%</b>	<b>Frequency</b>	<b>%</b>	<b>Frequency</b>	<b>%</b>
<b>Male</b>	15	75	43	43	137	55.9184
<b>female</b>	5	25	57	57	108	44.0816
<b>Total</b>	20	100	100	100	245	100

Male teachers were 43 while the female teachers were 57. Males students were 137 and female students 108.

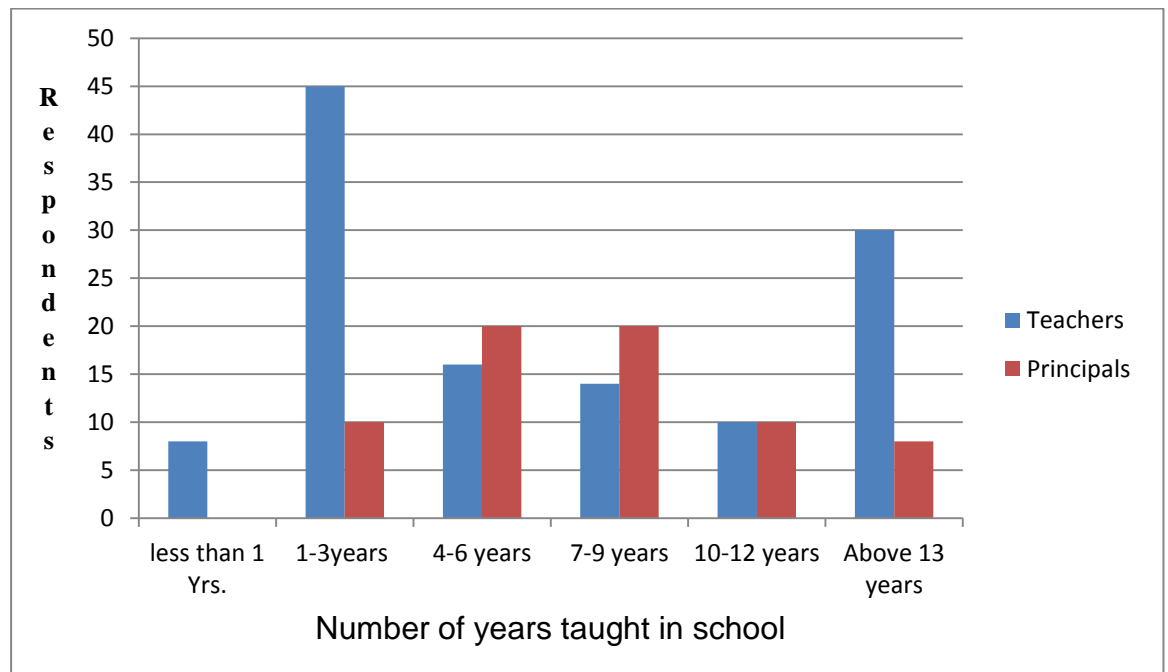
The principals and teachers were asked to indicate their highest level of education. The aim was to establish their possibility of having Computer training and use. Their responses are shown in Table 4.2.

**Table 4.2**

**Highest level of education for principals and teachers.**

Level of Education	Principals		Teachers	
	Frequency	%	Frequency	%
Master's Degree	2	10	-	-
Bachelor's Degree	16	80	94	94
Diploma	2	10	3	3
P1			3	3
<b>Total</b>	<b>20</b>	<b>100</b>	<b>100</b>	<b>100</b>

Majority of the principals and teachers 80% and 94% respectively had bachelor's degree meaning there was a high likelihood they had exposure with computers.



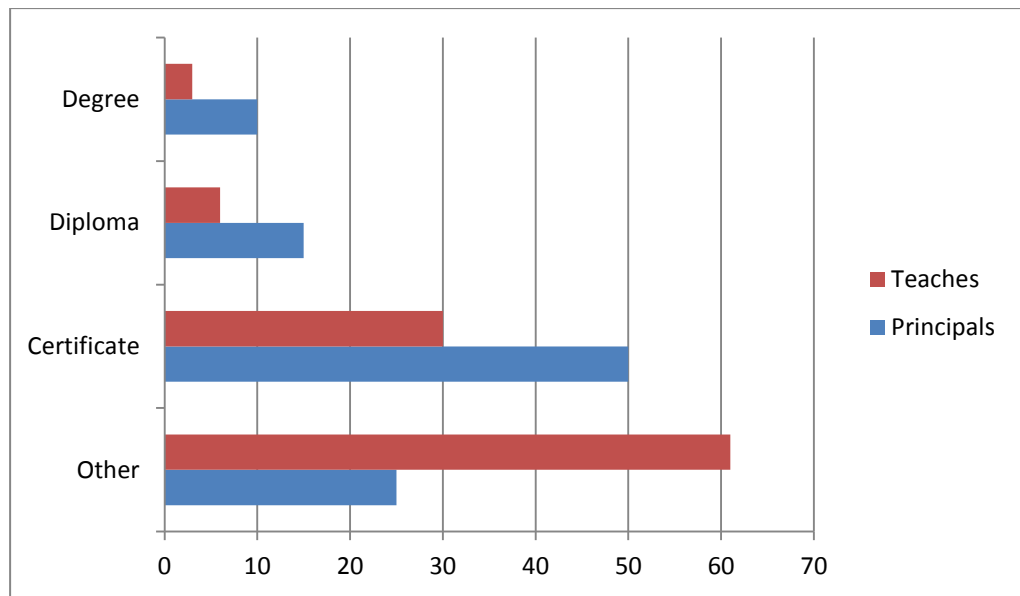
**Figure 4.1 Number of years taught in that school.**

A total of 10 principals and 45 teachers had been working in that school for between one year and three years, meaning they had limited experience in ICT use; assuming that they had not interacted with ICT in another school. Those who had been in that school for between 4-6 years were 20 principals and 16 teachers. Meaning they had a good exposure to ICT equipment and likely to integrate ICT in teaching and learning. Those who taught for more than 13 years were 8 principals and 30 teachers. Meaning they had sufficient exposure to the ICT equipment and expected to integrate ICT in teaching and learning.

#### **4.4. Influence of teacher characteristics on integration of ICT in teaching and learning in secondary schools.**

The first objective was to establish the influence of teacher characteristic on integration of ICT in teaching and learning. This was because studies have shown teacher characteristics such as training has influence on ICT integration in teaching and learning (Earle, 2002). The principals and teachers were asked if they had received any training in the use of computers. Those who responded in the affirmative were then asked the level of training they had received in the use of computers. The outcomes are as shown in the Figure 4.2





**Figure 4.2 Level of training in ICT among Principals and Teachers.**

From Figure 4.2 half of principals 50% and teachers 30% had a certificate in computer training. The low level of training could have a negative impact on integration of ICT in teaching and learning as argued by Border (2010) that lack of knowledge of computers prevented ICT integration.

The principal and teachers were then asked to indicate how long they had been using computers for official purpose. The aim was to establish if they had gained enough exposure and competence in use of computers in teaching and learning as postulated by Peralta and Costa (2007) that teachers with more experience with computers have a greater confidence and ability to use them effectively. The results are shown in Table 4.3

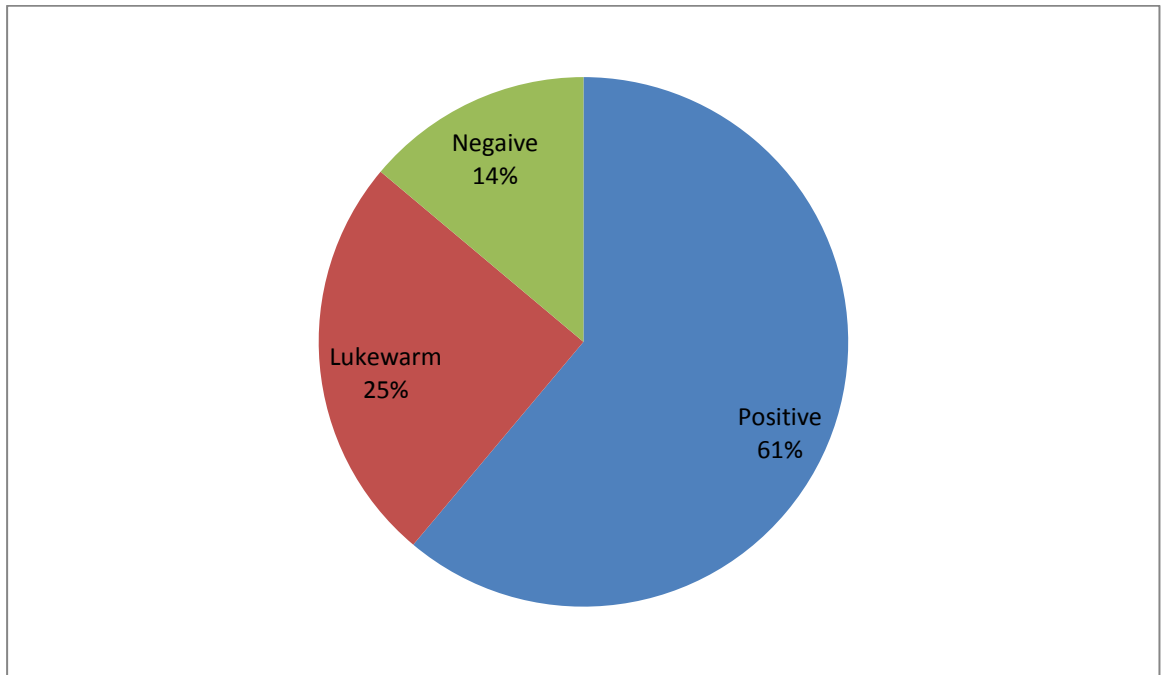
**Table 4.3****Number of years principals and teachers had used computers**

<b>No. of Years</b>	<b>Principals</b>		<b>Teachers</b>	
	Frequency	%	Frequency	%
None	0	0	18	18
Less than 1	0	0	2	2
1	0	0	6	6
2	3	15	4	4
3	2	10	4	4
4	3	15	6	6
5	10	50	36	36
Over 5	2	10	24	24
<b>TOTAL</b>	20	100	100	100

From table 4.3 the majority of principals 50% and teachers 36% had been using computers for 5 years. This gives them enough time to gain experience in the use of computers to integrate ICT in teaching and learning. It was found that 18% of the teachers had not been using computers. They were therefore not competent in use of ICT preventing its integration in teaching and learning as argued by Jones (2004) that teachers' competence related directly to confidence and the ability of the teachers to use computers.

The teachers were then asked how they rated their attitude towards the use of computer in teaching.

The responses are shown in Figure 4.3

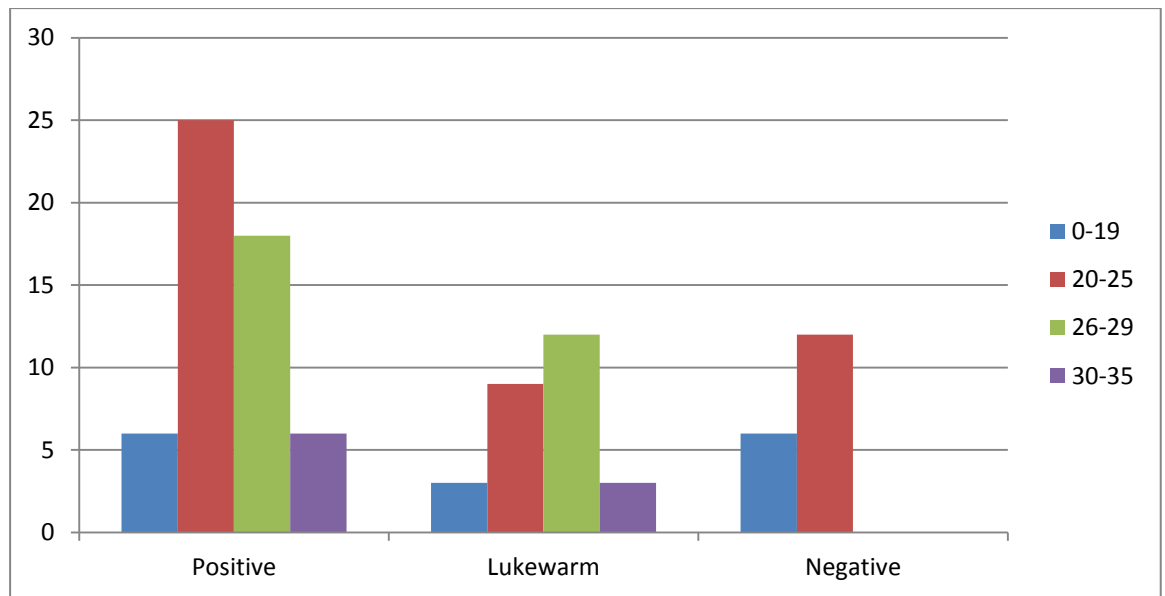


**Figure 4.3. Teachers' attitude towards the use of computers in teaching.**

Figure 4.3 indicates that 14% of the teachers had a negative attitude and 25% lukewarm attitude towards the use of computers. A total of 39% of the teachers in the Sub-county were therefore not likely to use ICT in teaching. The teachers' attitude is therefore affecting the use of ICT negatively as found in a study carried out by Demici (2009) which concluded that a teacher's attitude determined successful integration of ICT into Geography lessons.

The teachers were asked to state their workloads per week. This way then compared to their attitude to find out if the teachers' workloads affected the use of ICT in teaching.

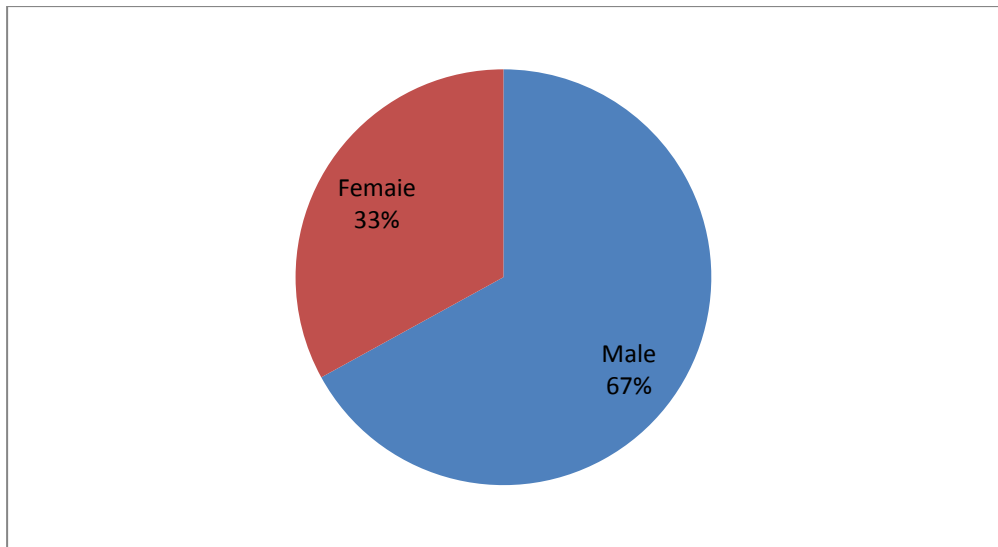
The outcomes are shown in Figure 4.4



**Figure 4.4. Teacher's workload compared to their attitude towards the use of ICT in teaching.**

From figure 4.4 Teachers' work load had a negative relationship with attitude towards the use of ICT since those with a negative attitude towards the use of computers had workloads of less than 20 and a maximum of 20-25 lessons per week. Those with high workloads of above 30 had a positive attitude towards the use of computers in teaching and learning.

The students were asked the gender of the teachers who used computers mostly. The aim was establish if the gender of the teachers had any influence on the integration of ICT in teaching and learning. The outcomes are shown in figure 4.5.



**Figure 4.5 Gender of teachers who mostly used computers in teaching.**

Figure 4.4 shows that majority (67%) of the teachers who used computers were male. This concurs with the findings of Kay, Wozney and Watson (2006) in Queensland State that female teachers were integrating technology less than male teachers. The shows that gender has significant impact on integration of ICT in teaching and learning. Again it may mean more male teachers have trained in ICT integration in teaching and learning than their female counterparts or female teachers have a negative attitude towards utilization of digital resources to enhance teaching and learning.

#### **4.5 The Influence of ICT technical support on integration of ICT in teaching.**

The second objective was to establish the effect of ICT technical support on the integration of ICT in teaching in secondary schools. Studies have shown that technical support has influence on teachers' integration in teaching and

learning. The principals, teachers and students were asked if their school had ICT resources. Their responses revealed that 64% of the school did not have ICT resources. The principals were then asked whether their schools had computer laboratory. Their responses revealed that only 23% of the schools had a computer laboratory. The principals were then asked whether their schools had an ICT co-ordinator or champion. Their responses revealed that only 33% of the schools had an ICT co-ordinator. This indicates that in 67% of the schools there was no technical support given to the students and teachers. This strongly hampers the integration of ICT as argued by Pelgrum (2005) that one of the top barriers in ICT use was lack of technical assistance. Teachers were asked the kind of support they got from the ICT co-ordinator in their schools. An analysis of the responses from the 8 schools with an ICT champion gave the responses shown in Table 4.5.

**Table 4.4**

**Technical support to teachers from ICT Co-ordinators in Secondary schools**

<b>Technical support</b>	<b>Frequency</b>	<b>%</b>
Accessing documents online	6	6.0
Advisory services	3	3.0
Searching information	9	4.0
Results analysis	3	3.0
Training how to operate computers	20	20.0
Opening web sites	12	12.0
Printing reading materials	12	12.0
Connecting of appliances	3	3.0
Use of projectors	3	3.0
Total	71	71.0

The results revealed that 29% of the teachers had not received any assistance from the ICT co-ordinators in their schools. This prevents integration of ICT in the schools. This was also established by Gomes (2005) that ICT integration in science needs a technician and if one is not available lack of support becomes an obstacle.

Teachers were also asked to indicate how long they took looking for educational materials on the web. Their responses are shown in Figure 4.5

**Table 4.5**

**Time teachers take to search for educational materials on the web.**

<b>Duration</b>	<b>Frequency</b>	<b>%</b>
0 minutes	28	28
10 minutes	18	18
30 minutes	14	14
1 hour	16	16
3 hours	24	24
Total	100	100

Table 4.5. Show that 24% of teachers take 3 hours to look for educational materials on the web. This can be attributed to poor internet connectivity with computers failing to connect to the web sites. From the Table 4.5 28% of the teachers did not look for educational materials on the web. This is due to lack of internet connectivity in the schools. Lack of connectivity and waiting long for computers to connect prevents integration of ICT in teaching and learning as argued by Sicilia (2005) that technical barriers to teachers included waiting long for websites to load and failing to connect to the internet.

The principals were asked to indicate computer student ratio in their schools. The average computer ratio was computed at 1:13 for the schools that had a computer laboratory in the Sub-county. The ratio is too high to allow effective integration of ICT into teaching and learning as found by Yilmaz (2011) that it was crucial to provide schools with hardware for continued use of ICT.



Teachers were then asked to indicate the number of computer servers, work stations and computers connected to the internet in their school. Their responses are as indicated in Table 4.6

**Table 4.6**  
**ICT technical support in schools.**

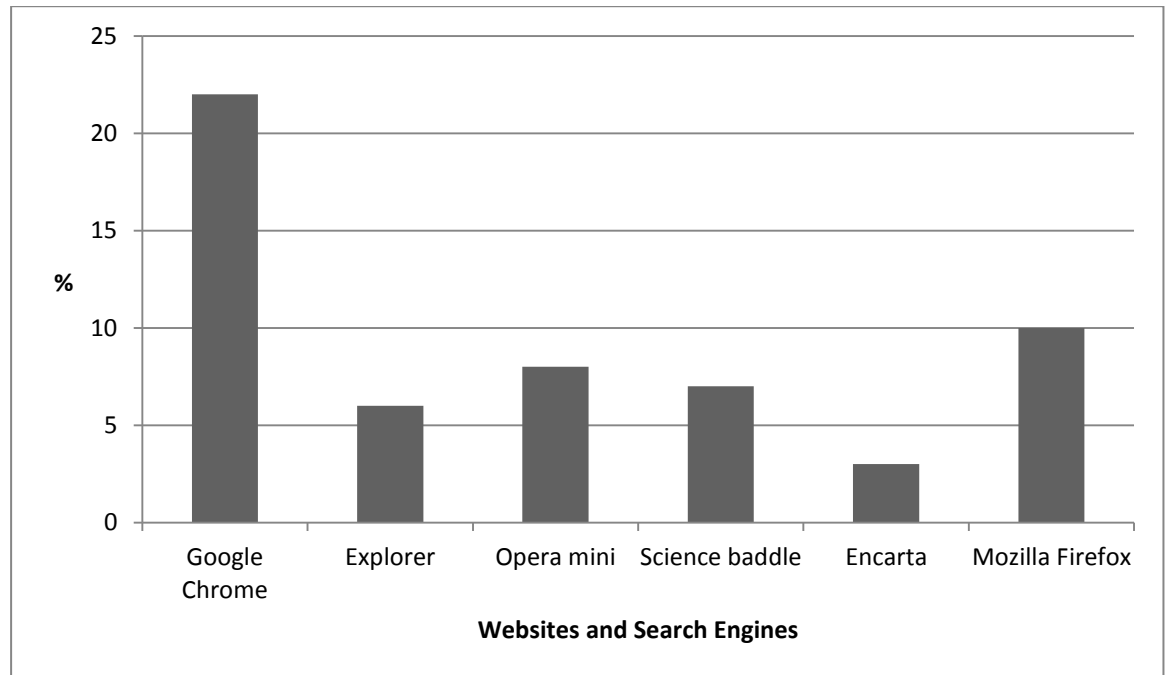
<b>ICT equipment</b>	<b>Quantity</b>	<b>No. of Schools</b>	<b>%</b>
Computer servers		21	95.5
	1	1	4.6
Work stations		11	50.0
	1-10	6	27.3
	More than 10	5	22.7
Internet connection	Connected	6	27.3
	Not connected	16	72.7
Printers available	1	11	50.0
	2	11	50.0

Table 4.6 Show that 50% of the schools do not have work stations that can allow integration of ICT in teaching and learning while 95.5% of the schools lack computer servers. The Table 4.6 also show that 72.7% of the schools are not connected to the internet. This prevents the integration of ICT in teaching and learning by preventing the sharing of information and also access of educational materials from the internet. The lack of work stations also prevents the use of digital content even when the teachers have access to the

internet. This collaborate the argument by Yilmaz (2011) in Turkey that providing schools with hardware was crucial for continued use of ICT in schools.

The students were then asked to indicate whether they spend any time looking for educational information on the web. The responses were 24.5% yes and 75% no. This means majority of the students did not access learning materials in the internet.

The teachers were then asked their favourite web or search engines for curriculum planning and instructional purposes. The outcomes are shown in Figure 4.5



**Figure 4.6 Favourite websites and search engines by teachers**

Figure 4.5 Show that only 56% of the teachers use websites and search engines. Meaning that 44% of the teachers do not use any websites or search engines for educational and curriculum purposes. This clearly indicates that the teachers do not integrate ICT in teaching and learning.

The teachers were then asked to indicate the kind of support they get from the school administration in integrating ICT in teaching and learning. Their responses are shown in Table 4.7.

**Table 4.7**

**Administrative support to teachers in ICT integration**

<b>Type of support</b>	<b>Frequency</b>	<b>%</b>
Provision of ICT infrastructure and materials	40	40
Maintenance and repair of ICT equipment	11	11
Providing internet connectivity	30	30
Providing alternative power to mains electricity	21	21
Employment of ICT coordinator and Training	40	40

Table 4.7 Show the level of support from the school administration is low since only 11% of the available infrastructure was adequately repaired and maintained according to the teachers. This prevents the integration of ICT since teachers were working using malfunctioning computers and printers due to poor maintenance and repairs. This works against integration of ICT as found by Korte and Housing (2007) in Britain that schools appreciated the

significance of administrative support to help teachers integrate ICT without wasting time in trouble shooting hardware and software problems.

#### **4.6 Influence of technological characteristics on integration of ICT in teaching.**

The third objective was to find out the influence of technological characteristics on the integration of ICT in teaching in secondary schools. The students were asked to indicate if teachers used digital content in their lessons. Their responses were 34% yes and 66% no. This means there was limited ICT integration in teaching and learning.

They were then asked to state the ICT resources used by teachers in teaching. Their responses are shown in Table 4.8

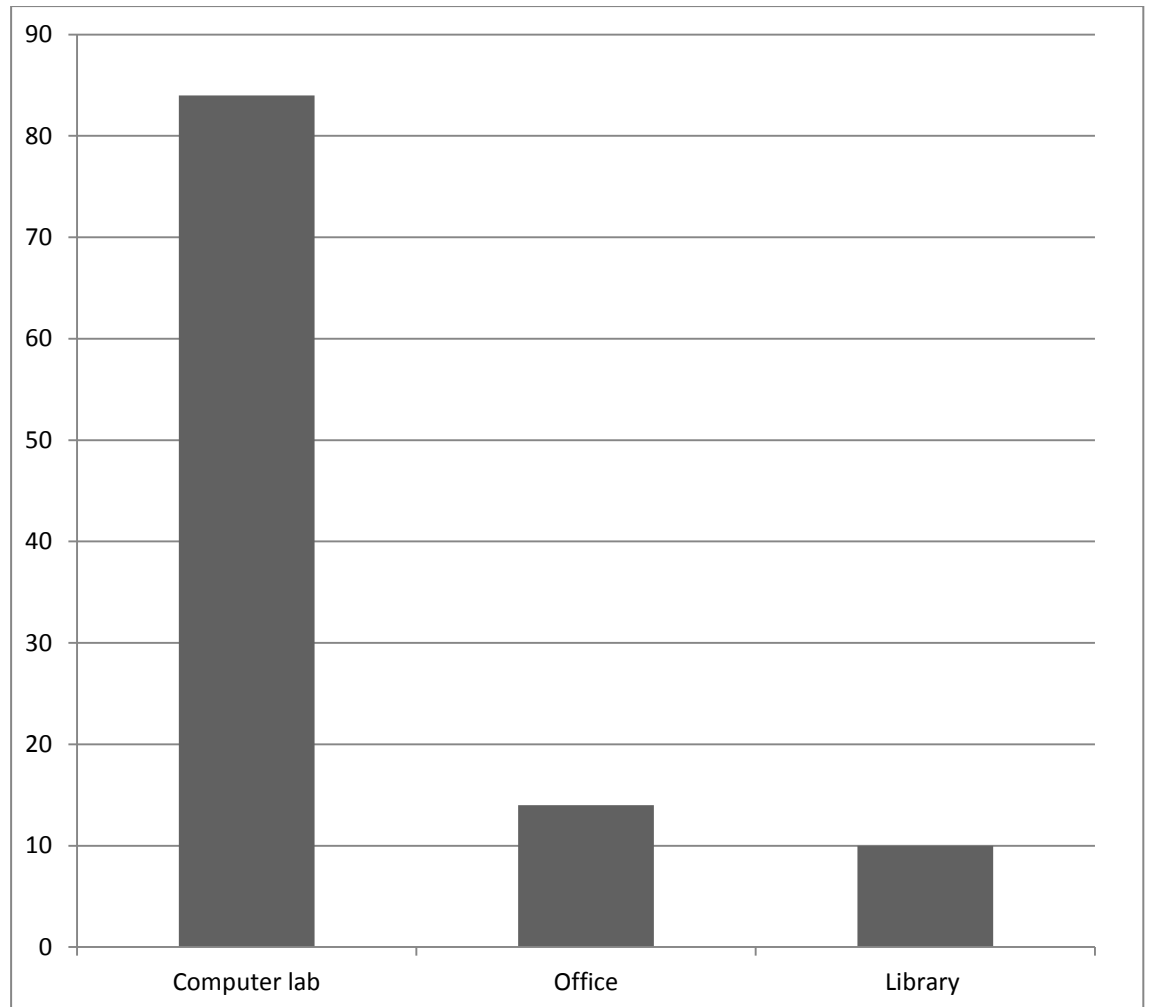
**Table 4.8**

##### **I.C.T Resources used by teachers in teaching**

<b>I.C.T Resource</b>	<b>Frequency</b>	<b>%</b>
Projectors	5	5.0
Display boards	1	1.0
Digital content	5	5.0
Laptops	24	24.0
Printers	8	8.0
Desk top computers	20	20.0
<b>Total</b>	<b>63</b>	<b>63.0</b>

Table 4.8 shows that the majority of teachers 24% use laptops due to their ease of use. It was however observed that they were only used in computer studies as indicated by the students. Only 5% of teachers used projectors and digital content in other subjects according to the students' responses. This was due to complexity of the content. Rodgers (2003) observed that complexity is a significant factor impacting the adoption of ICT.

The students were then asked where the computers in the school were located. The responses from the students are shown in Figure 4.8



**Figure 4.7 Location of computers in the school**

Only 10% of the students indicated that their school had computers in their school library. This prevents integration since the computers are not accessible to the students for personal use. The majority 84% of the computers were located in the computer lab. This indicates that they are only accessible to the computer studies lessons. This prevents integration as found by a study in Turkey (2007) that the probability associated with the use of ICT depended on the ease of use and accessibility.

Teachers were asked how they rated the operating system in the computers in their schools. They were also requested to state the percentage of instructional time they used in incorporate digital resources in their teaching. The responses are compared in table 4.9

**Table 4.9**

**Comparison of teachers rating of the operating system to time used to incorporate digital resources in teaching**

Rating	Frequency	% of teachers	Time spend by teachers to incorporate digital resources
Simple	26	26	5%
Complex	16	16	1%
Not aware	58	58	

Table 4.9 Show 26% of the teachers rated the operating system in the computers in their schools as simple. These teachers spend 5% of their time

incorporating digital content. Table 4.9 further show that 16% of teachers who rated the system as complex spent only 1% of their time in incorporating digital resources in teaching. The ability to integrate ICT therefore depends on the perceived complexity or ease of use of the operating system. Smarkula (2007) observes that the perceived complexity and ease of use were predictors of user acceptance of computer technology. The teachers were asked if the technology used in ICT equipment made it easy for them to integrate ICT into learning and teaching. Their responses were 56% yes, 35% no and 9% were not sure. The teachers gave the reasons for their answers as shown in table 4.10

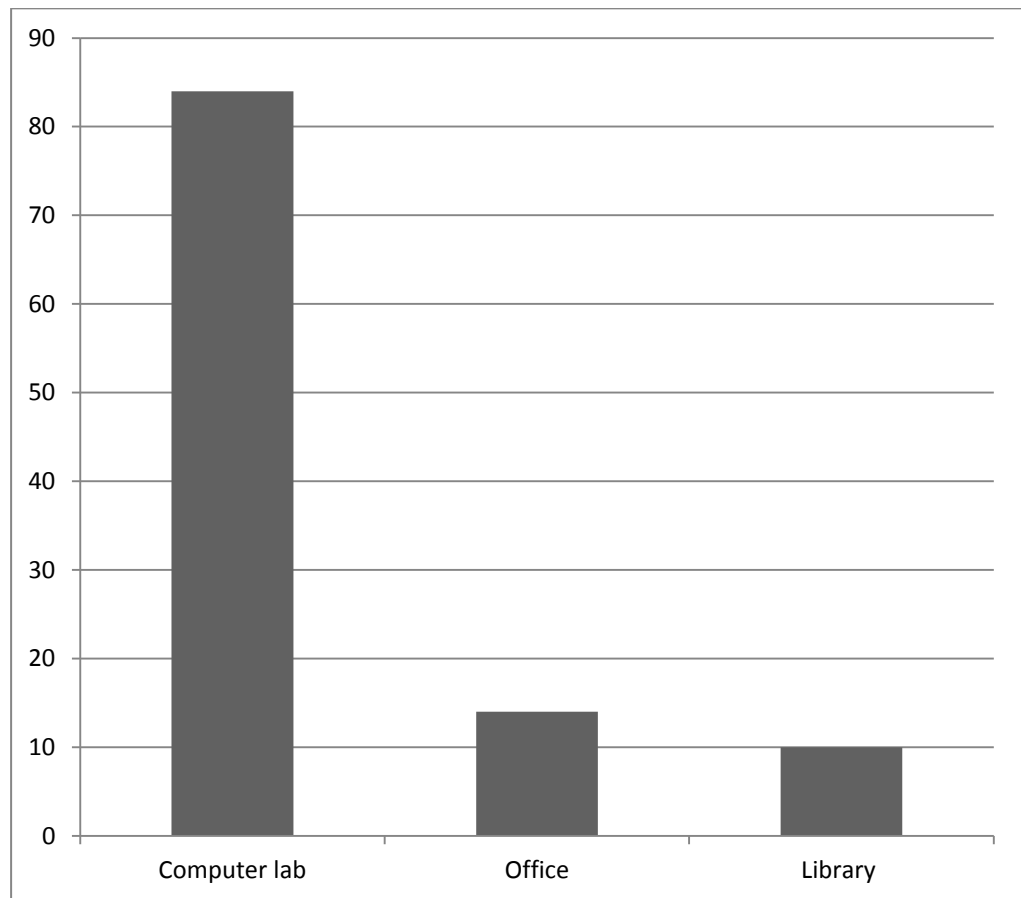
**Table 4.10:**

**Technology aspects and teacher perception on ease or difficult of use**

<b>Technology aspects that make integration easy</b>	<b>Technology aspects that make integration difficult.</b>
It saves time	Computers are few
Its user friendly	Lack of digital content in schools
Makes learning learner centred	Teachers lack competence in ICT
Allows sourcing of educational materials	It's not usable in the normal classroom setting
Allows students to research	
Simplifies learning concepts	
Makes learning practical	

It is clear that ICT integration is only possible if the operating system/technology used in the computers make teaching and learning easy as observed by 56% of the teachers in Kilungu Sub County. The integration is however made difficult when teachers lack competency in ICT or are not compatible with existing practices .This was observed by Askar and Bas (2008) who argued that ICT integration becomes difficult when it's not compatible with existing practices for example use in normal classrooms.

An observation schedule sought to establish the location of computers in the school. The results are shown in figure 4.9 for those schools which had computers.

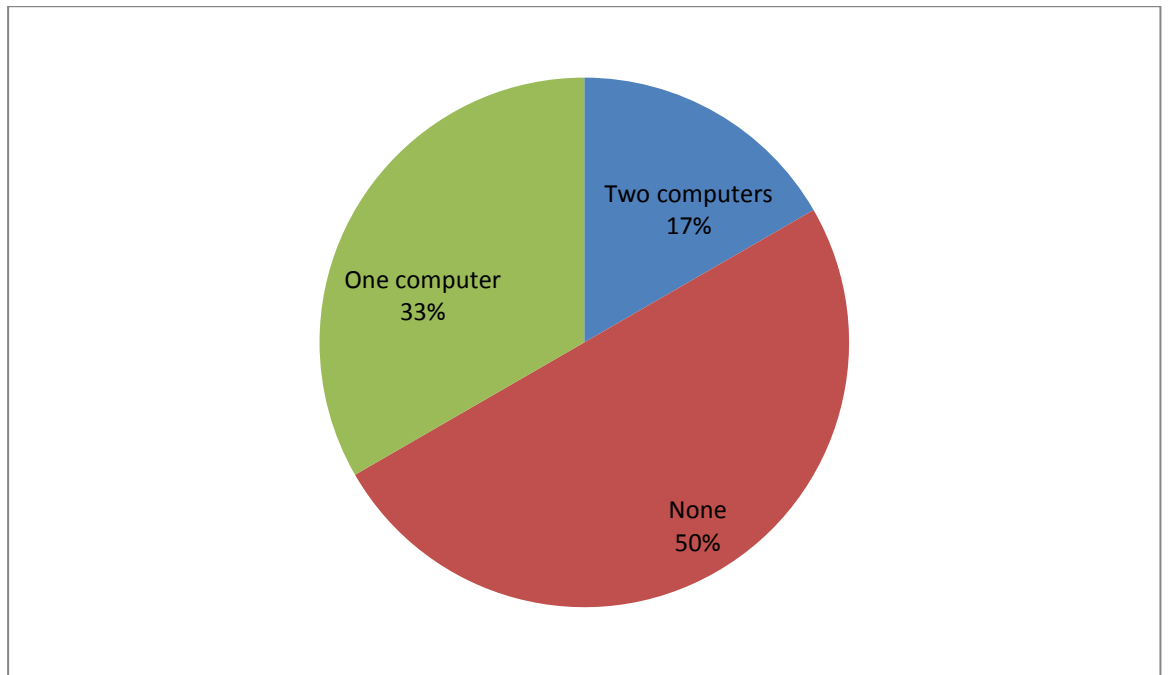


**Figure 4.8 Location of computers in the school. (Observation schedule**



In majority of the schools 84% of the computers were located in the computer lab. This prevents integration of ICT since teachers have restricted access to the computers.

The researcher also observed the number of computers available in the staffroom for use by teachers. The results are shown in figure 4.10.



**Figure 4.9 Number of computers available in the staffroom for use by teachers**

Figure 4.10 Shows that 50% of the schools do not have any computer in the staffroom for use by the teachers. This prevents the integration of ICT in teaching and learning since teachers cannot access ICT equipment. Teachers however perceived ICT as very useful in making teaching and learning easier.

#### **4.7 Influence of teachers' pedagogical strategies on the integration of ICT in teaching.**

The fourth objective was to establish the influence of the pedagogical strategies chosen by teachers on the integration of ICT. The researcher observed technology lessons on progress only in 30% of the schools. This is because majority 84% the computers were located in the computer lab mostly used for computer lessons.

The teachers were then asked to list the most favourable teaching approaches. This was compared to the time they took with learners to incorporate digital resources. The outcomes are shown in table 4.10.

**Table 4.11**

#### **Teaching approach and time taken to incorporate digital content.**

<b>Teaching approach</b>	<b>Frequency</b>	<b>%</b>	<b>% time taken to incorporate digital content</b>
Lecture	32	32.0	0.0
Discussion	24	24.0	0.0
Problem – answer	8	8.0	1.0
Group work	12	12.0	40.0
Practical	12	12.0	37.0
Presentations	12	12.0	45.0

Table 4.11 Show that the integration of ICT in teaching depends on the teachers' choice of teaching approach. The teachers who used the lecture method 32% did not incorporate digital content in their teaching. This was observed by Lim (2007) that ICT integration must be coupled with the necessary pedagogical strategies.

The students were asked to state the subject in which computers were mostly used. Their responses are shown in Table 4.12.

**Table 4.12**

**Subjects using computers**

Subject	Frequency	%
Maths	25	10.0
Business studies	18	8.0
Computer studies	138	56.0
Geography	64	26.0
Total	245	100.0

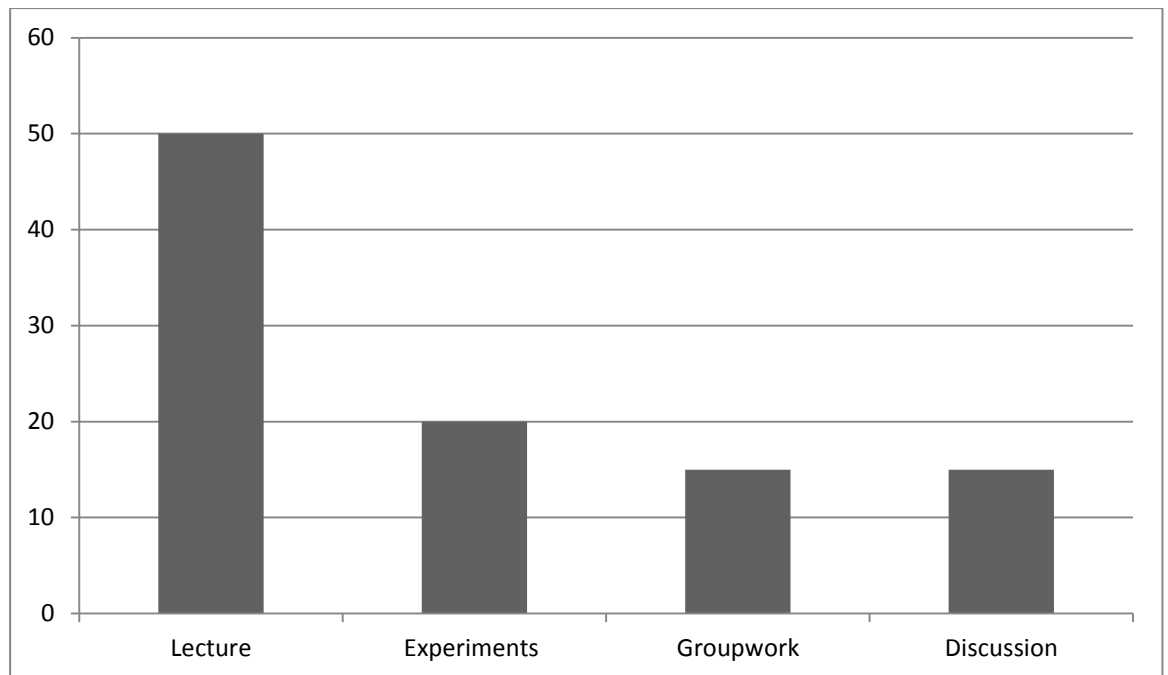
Table 4.12 show that 56% of the students were only exposed to computers in computer studies. This is due to the organization of the content as observed by Moseley and Higgins (1999) that ICT integration depends on the organization of particular topics or issues.

The students were asked whether they preferred being taught using computers or other methods such as books, chalk and chalkboard. The majority 65% preferred being taught by use of computers. They gave the following reasons

for their preference: Computers make students understand better, can correct spelling and grammatical errors, give more current information, develop students cognitive skills, create interest and concentration, make work easier and stimulate critical thinking. Those who preferred use of textbooks, chalk and chalkboard gave the following reasons: computers are expensive, teachers can make explanations and demonstrations on the chalkboard, textbooks are more understandable than computers, information is well analysed and that textbooks give more accurate and reliable information since they are approved by the government.

The integration of ICT is affected by the need to adapt to the diverse interests of students. The teachers need to integrate ICT to their teaching so as to enable students to learn since they have different interests.

The principals were asked to indicate whether their teachers used computers in teaching. Their responses were 30% yes and 70% no. They were then asked the teaching methods preferred by their teachers. The answers they gave are as shown in figure 4.11



**Figure 4.10 Teaching methods preferred by subject teachers**

From figure 4.11 50% of the teachers prefer using the lecture method of teaching. The use of ICT in teaching depends on the teachers' choice of teaching method. The choice of lecture as a method of teaching prevents the use of computers because it is a traditional teaching method that is teacher centred. The principals, teachers and students were asked to list what they considered as the greatest challenge in integrating ICT in teaching and learning. Their responses are as tabulated in table 4.13

**Table 4.13****Challenges facing integration of ICT in Kilungu Sub-county**

	Principals	%	Teachers	%	Students	%
<b>Lack of ICT training</b>	5	25	31	31	42	17.1
<b>Inadequate technical support</b>	8	40	44	44	92	37.5
<b>Complex operating systems</b>	5	25	25	25	81	33.1
<b>Difficult implementing technology</b>	2	10	2	2	30	12.3
<b>integrated lessons</b>						
<b>TOTAL</b>	<b>20</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>245</b>	<b>100</b>

The integration of ICT in teaching and learning is greatly affected by the availability of technical support. This accounts for 40% according to principals, 44% according to the teachers and 37.5% according to the students. On average this accounts for 40% failure to integrate ICT in teaching and learning. This was also observed by Pelgrum (2005) that one of the top barriers in use of ICT in education was lack of technical assistance.

## **CHAPTER FIVE**

### **SUMMARY, CONCLUSIONS AND RECOMMENDATIONS**

#### **5.1 Introduction**

This chapter outlines the summary of the study, the conclusions made from the study and recommendations from the study.

#### **5.2 Summary of the Study**

The study sought to establish school factors influencing integration of Information Communication Technology in teaching and learning in public secondary schools in Kilungu Sub-county. It was based on four objectives that teacher characteristics, ICT technical support, technological characteristics and teacher's choice of pedagogical strategy influence teaching and learning in secondary schools. Chapter one was the introduction in which the background and statement of the problem was done showing the variables of the study. The purpose, objectives and the significance of the study were outlined. The limitations and assumptions of the study were also outlined. In chapter two, literature related to the variables of the study was reviewed. This was literature on the influence of: teacher characteristics, ICT technical support, technological characteristics, and the teacher' choice of pedagogical strategy on integration of ICT in teaching and learning. A theory was identified to guide the study which is the constructivist learning theory. A conceptual framework was developed showing the relationship between the variables.

Chapter three was the research methodology in which the target population and research design were identified. Sampling procedures were shown and the research instruments used discussed. These were a questionnaire and an observation schedule. The validity of the instruments was established by writing questions from all the variables and consultation with the research supervisors. The reliability of the instruments was established through the test and retest technique. The researcher then got permit to collect data and visited the schools to administer the questionnaires and observe ICT equipment available in the schools and technology mediated lessons going on in the schools. The procedure for data analysis was identified in chapter three.

In chapter four, the data was analysed and interpreted by calculating percentages and frequencies of the variables. A discussion of the finding was done by drawing conclusions from the analysis of the data. The data was then presented using graphical and numerical method to show the findings of the study in each objective of the study.

### **5.3 Summary of the Findings**

From the analysis of the collected data the study established that all the Principals in Kilungu Sub-County had received some training in the use of computers. It was found that 49% of the teachers had however not received any training in the use of computers. The level of training was however low since the majority 50% of the principals and 30% of the teachers only held



certificates. Those with training had been using computers for an average of 5 years and could therefore integrate I.C.T into Secondary Education.

The teachers' attitude towards the use of computers was negative among 39% of the teachers. This was found to be mainly among teachers whose workload was less than 25 lessons per week. Those with 30 lessons and above per week had a positive attitude. This showed that teacher workload has no influence on ICT integration in teaching and learning. It was also established that male teachers use computers more compared to females.

The study found that 64% of the schools in Kilungu Sub-County did not have ICT infrastructure. Only 36.4% of the schools had a computer laboratory. Some of the schools with infrastructure were found to have the computers in the offices and staffroom. This completely prevented integration of ICT in learning. It was also established that only 36% of the schools had ICT Coordinators. From the teachers it was found that 36% of those in schools with co-ordinators had not received any support from the Co-ordinators. These impacts negatively on the integration of ICT in Secondary Education.

The study established that 75% of the schools were not connected to the internet. This prevented teachers from accessing educational materials from the Web. Those with internet indicated that they took long to look for educational materials as they waited for computers to connect. The average Computer: student ratio was computed to be 1:13 for those with a computer laboratory. This ratio was found to be too high for effective integration of ICT

in Secondary Education. The majority of the schools 5% did not adequately repair or maintain the computers since teachers reported working using malfunctioning computers and printers which prevented Integration of I.C.T in Education.

The study found that technological characteristics influence integration of ICT in teaching and learning. Only 5% of teachers used projectors due to complexity of the content. In 84% of the schools the computers were found in the computer Laboratory or in the offices. Only 10% of the schools had computers in the Library which made the computers inaccessible to the students.

The majority of teachers 58% were not aware of the operating system used in computers. They therefore never spend time in incorporating digital content into their teaching. Of those who were aware 16% rated the operating system as complex and therefore only spend 1% of their teaching time in incorporating digital content. The perceived complexity of the operating systems therefore tended to prevent the use of ICT.

The study also established that only 5% of the teachers used projectors and digital content due to complexity of digital content. 35% of the teachers also found the technology used in ICT equipment never made integration easy. This was mainly due to lack of competence in ICT among the teachers and the fact that it was not useable in a normal classroom hence preventing ICT integration in teaching and learning.

Integration of ICT was also influenced by the teachers' choice of pedagogical strategies. The majority of the teachers, 32% used lecture and therefore never used class time to integrate ICT since it was found to be incompatible. Only 12% of teachers used practical's and presentations which allowed 37% and 45% of class time to be used to in incorporating digital content into teaching. It is therefore the pedagogical method that determines the use of ICT.

The study found that 56% of the students were only exposed to computers during computer study lessons. This is because of the organization of the content that required demonstrations and practical. The organization of the content then determined the pedagogical method needed to teach. The organization of the content made teachers choose the lecture method of teaching hence preventing the use of computers.

#### **5.4 Conclusions**

The following conclusions can be made from the analysis of data from the sample population. The ability to integrate ICT in teaching and learning was highly influenced by teacher characteristics. Only 3% of the teachers had a degree and 6% had a diploma in ICT. This low percentage was the same that had been using computers for more than three years. This translated to the high negative attitude among 38% of the teachers towards the integration of computers into teaching. The gender of the teacher also affected ICT integration with 67% of male teachers more likely to use computers in teaching compared to 32% of female teachers likely to use computers.

The lack of ICT technical support to the schools prevents the integration of ICT in teaching and learning. This was evidenced by lack of computer laboratories in 64% of the schools. Only 36% of the schools had an ICT coordinator to support teachers in using ICT in teaching and learning. Schools also lacked internet connectivity with only 26% of the schools having internet connectivity. This prevents teachers from sourcing educational materials from the internet. The computer student ratio was one computer for 13 students in schools that had a computer laboratory.

Schools in Kilungu Sub-county did not have ICT infrastructure. Only 36% of the schools had a computer laboratory. In majority of the schools the computers were only found in the offices thus preventing the integration ICT into learning. Schools completely lacked projectors and white boards to allow use of ICT in teaching and learning. In schools with computer laboratories one computer was earmarked for 13 students making it difficult to integrate ICT into teaching and learning. Lack of internet connectivity prevents teachers from accessing educational materials from the web. Even where connectivity was available it took too long to connect to the internet. This was sometimes caused by lack of adequate repair and the use of malfunctioning computers. The majority of teachers 74% found the digital content and ICT equipment complex to use. This was caused by lack of ICT knowledge which made teachers incompetent in the use of computers and the digital content. The study established that only 5% of the teachers were competent in the use of ICT equipment.

Teachers preferred using the lecture method of teaching which is not compatible with the use of ICT compared to practical and presentations or demonstrations. This was partly due to the organisation of the content in most subjects in the secondary school curriculum. This greatly prevented the use of ICT in teaching and learning.

### **5.5 Recommendations**

Based on the findings of the study, the researcher recommends the following;

- i. The Government should increase the number of the computers in the schools which have computer labs.
- ii. The government should build computer labs in the schools that do not have them.
- iii. In service training for teachers in ICT integration should be prioritized.
- iv. Efforts should be made to encourage all teachers to integrate ICT in teaching and learning. This can be done through capacity building of the teachers on learner centered pedagogical approaches in teaching and learning every year.
- v. The government should employ ICT technical assistants in all the schools to help teachers in ICT integration in teaching and learning.

### **5.6 Suggestion for further study**

Based on the finding of the study the researcher suggests the following studies to be carried out to complement this study.

- (i) The study should be replicated in other sub-counties to make it applicable to the whole country.
- (ii) Further research to be done to investigate whether some school subjects are better suited for ICT integration than others.
- (iii) A study be carried out to investigate if the training of teachers discourages ICT integration in teaching.

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## APPENDIX 1

### INTRODUCTORY LETTER TO SCHOOLS

Augustine Mulinge Mutua

P.O. Box 285-90132,

Sultan Hamud

To whom it may concern

#### **RE: PERMISSION TO CARRY OUT RESEARCH**

I am a University of Nairobi student, undertaking a research project on **Factors influencing ICT integration in teaching and learning in secondary schools in Kilungu Sub-county**. Your school has been selected to participate in this study.

I hereby seek your permission to be allowed to visit your school to collect data and information pertinent to this research study. I also request to be allowed to observe technology-mediated lessons which might be on progress by the time of the research.

You are hereby assured that your identity and information thus provided will be treated with utmost confidentiality.

Yours faithfully,

---

Augustine Mulinge Mutua

## APPENDIX II

### QUESTIONNAIRE FOR PRINCIPALS OF SECONDARY SCHOOLS

You are requested to fill out the questionnaire by choosing the appropriate responses or writing your honest responses to the open questions

#### SECTION A: Background Information

1. a) Indicate your gender                      Male                                            Female                     

b) What is your highest level of education? \_\_\_\_\_

c) How many years have you served as a Principal in this School? \_\_\_\_\_

d) Indicate the total number of students in your school

Boys \_\_\_\_\_                      Girls \_\_\_\_\_                      Total \_\_\_\_\_

e) Indicate number of Teachers in your School

Male \_\_\_\_\_                      Female \_\_\_\_\_                      Total \_\_\_\_\_

#### SECTION B: Factors influencing ICT integration in teaching and learning

2. Does your school have an ICT infrastructure? Yes                                            No                     

3. a) Have you received any training on how to use computers? Yes                                            No                     

b) If yes where did you receive your training? \_\_\_\_\_

c) What level of training did you receive? \_\_\_\_\_

4. How much time do you spend searching the web for personal (not work related) information? \_\_\_\_\_

5. How long do you spend looking for educational resources on the web?  
\_\_\_\_\_

6. On average what percentage of your instructional time with learners incorporates digital resources? \_\_\_\_\_

7. How have digital resources changed the way you plan or structure your instruction? \_\_\_\_\_  
\_\_\_\_\_
8. a) List a favourite website or search engine you use for professional development, curriculum planning or instructional purpose \_\_\_\_\_  
\_\_\_\_\_
- b) Briefly describe the purposes of website if applicable. \_\_\_\_\_  
\_\_\_\_\_
9. How many years have you been teaching? \_\_\_\_\_
10. How long have you been using computers for personal/commercial or official purpose? \_\_\_\_\_
11. What source of power do you have? \_\_\_\_\_
12. a) Is there a computer lab in your school?      Yes         No
- b) If yes how many computers are in the Lab \_\_\_\_\_
- c) What it is the pupil/PC ratio \_\_\_\_\_
13. For each of the following indicate the number available in the school.
- a) Computer servers                         c) Work stations (Pcs)
- b) Computer connected to internet      d) Printers
14. a) Does the school have an ICT coordinator/champion? Yes    No
- b) What kind of support do the coordinators lend to the teachers  
(if applicable?) \_\_\_\_\_
15. How you would rate your teachers' attitude towards use of computers in teaching and learning? i) Negative    ii) Positive    iii) Lukewarm
16. What teaching methods are preferred by your teachers? \_\_\_\_\_

17. a) Do you face any challenges in ICT integration in teaching and learning

in your school? Yes  No

b) Please explain \_\_\_\_\_

18. What do you consider the greatest challenge facing ICT integration in

teaching and learning in your school? \_\_\_\_\_

*Thank you for taking your time to answer the questions.*

### APPENDIX III

## QUESTIONNAIRE FOR SUBJECT TEACHERS OF SECONDARY SCHOOLS

You are requested to fill out the questionnaire by choosing the appropriate responses or writing your honest responses to the open questions

### SECTION A: Background Information

1. a) Indicate your gender                      Male                       Female
- b) What is your highest level of education? \_\_\_\_\_
- c) How many years have you been teaching in this School? \_\_\_\_\_
- d) Indicate the total number of students in your school  
        Boys \_\_\_\_\_                      Girls \_\_\_\_\_                      Total \_\_\_\_\_

### SECTION B: Factors influencing ICT integration in teaching and learning

2. Does your school have an ICT infrastructure?    Yes                       No
- 3a) Have you received any training on how to use computers?    Yes     No
- b) If yes where did you receive your training? \_\_\_\_\_
- c) What level of training did you receive? \_\_\_\_\_
4. How much time do you spend searching the web for personal (not work related) information? \_\_\_\_\_
5. How long do you spend looking for educational resources on the web? \_\_\_\_\_
6. On average what percentage of your instructional time with learners incorporates digital resources? \_\_\_\_\_
7. How have digital resources changed the way you plan or structure your instruction? \_\_\_\_\_

8. a) List a favourite website or search engine you use for professional development, curriculum planning or instructional purpose \_\_\_\_\_
- a) Briefly describe the purposes of web site if applicable. \_\_\_\_\_
9. How long have you been using computers for personal/commercial or official purpose? \_\_\_\_\_
10. What source of power do you have in the school? \_\_\_\_\_
11. a) Is there a computer lab in your school? Yes  No
- b) If yes how many computers are in the Lab \_\_\_\_\_
- c) What is the pupil/PC ratio \_\_\_\_\_
12. For each of the following indicate the number available in the school.
13. a) Computer servers  c) Work stations (Pcs)
- b) Computer connected to internet  d) Printers
14. How would rate the operating system installed in the computers in your school?
- Simple  Complex
- Explain \_\_\_\_\_
15. Does the technology used in ICT equipment in your school make it easy for you to integrate ICT in teaching and learning? Yes  No
- Explain \_\_\_\_\_
16. a) What subject do you teach in your school? \_\_\_\_\_
- b) What is your current teaching load? \_\_\_\_\_
- 17.a) Does the school have an ICT coordinator/champion? Yes  No
- b) What kind of support does the coordinators/Champion lend to you (if applicable)? \_\_\_\_\_



17. How you would rate your attitude towards use of computers in teaching and learning?

i) Negative     ii) Positive     iii) Lukewarm

19. Please list two of your most favourable teaching approaches.

i) \_\_\_\_\_    ii) \_\_\_\_\_

20. a) Do you fear losing influence over your work by using computers?

Yes     No

b) Please explain \_\_\_\_\_

21. How does the school administration support ICT integration in Teaching and learning in your school? \_\_\_\_\_

\_\_\_\_\_

22. What do you consider the greatest challenge facing ICT integration in teaching and learning your school? \_\_\_\_\_

\_\_\_\_\_

*Thank you very much for taking your time to answer these questions.*

## APPENDIX IV

### QUESTIONNAIRE FOR STUDENTS OF SECONDARY SCHOOLS

You are requested to fill out the questionnaire by choosing the appropriate responses or writing your honest responses to the open questions

#### SECTION A: Background Information

1. a) Indicate your gender            Male             Female
- b) How long have you been in this school? \_\_\_\_\_
- c) How many are the student's in your class? \_\_\_\_\_

#### SECTION B: Factors influencing ICT integration in teaching and learning

2. Does your school have an ICT infrastructure?            Yes             No
- 3 a) Have you been trained on how to use computers?    Yes             No
- b) If yes who trained you? \_\_\_\_\_
4. Do you spent any time looking for educational resources/information on the web?            Yes             No
5. Do your teachers incorporate digital resources in your lessons? Yes  No
- If yes, what resources do they use? \_\_\_\_\_
6. Other than in school, where else do you use computers? \_\_\_\_\_
7. Where are the computers located within the school? \_\_\_\_\_
8. How accessible are the computers to students? \_\_\_\_\_
9. a) In which subject do you use computers the most? \_\_\_\_\_
- b) Which is the gender of the subject teacher? Male             Female
10. Which do you prefer more?
- a) Teachers using computers to teach

b) Teachers using textbook, chalk and blackboard to teach.

Please explain \_\_\_\_\_

11. What are the challenges facing ICT integration in teaching and learning in your school? \_\_\_\_\_  
\_\_\_\_\_

*Thank you very much for taking your time to answer these questions.*

## APPENDIX V

### **OBSERVATION SCHEDULE FOR THE RESEARCHER**

Upon visiting the schools the researcher will seek to find out

- 1) Presence of computer lab \_\_\_\_\_
- 2) Numbers of computers in the school \_\_\_\_\_
- 3) Location of the computers \_\_\_\_\_
- 4) Presence of power supply \_\_\_\_\_
- 5) Actual technology lessons on progress \_\_\_\_\_
- 6) Number of computers in the staff room for teacher use \_\_\_\_\_

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

**CONDITIONS**

- 1. You must report to the County Commissioner and the County Education Officer of the area before embarking on your research. Failure to do that may lead to the cancellation of your permit**
- 2. Government Officers will not be interviewed without prior appointment.**
- 3. No questionnaire will be used unless it has been approved.**
- 4. Excavation, filming and collection of biological specimens are subject to further permission from the relevant Government Ministries.**
- 5. You are required to submit at least two(2) hard copies and one(1) soft copy of your final report.**
- 6. The Government of Kenya reserves the right to modify the conditions of this permit including its cancellation without notice.**

**NACOSTI**  
National Commission for Science, Technology and Innovation

**RESEARCH CLEARANCE PERMIT**

Serial No. A **5762**

**CONDITIONS: see back page**



## APPENDIX VI

### LESSON/ CLASSROOM OBSERVATION SCHEDULE

Name of Institution:			
Teachers name:			Observer's Name:
Class	Learners present	Time: Date	Subject: Topic:
Lesson Topic:			
Observation Area			What was observed
1. Introduction and lesson organisation			1.
2. Content deliver			2.
3. Teaching methods techniques			3.
4. Learner involvement and communication			4.
5. Teaching/ learning resources			5.
6. Classroom management			6.
Observer's comments on level of ICT integration evident in the lesson:			