TEACHER FACTORS INFLUENCING INTEGRATION OF INFORMATION AND COMMUNICATION TECHNOLOGY IN TEACHING AND LEARNING IN PUBLIC SECONDARY SCHOOLS IN SAMBURU NORTH SUB-COUNTY, KENYA

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Dedication

I dedicate this work to the late Sigrid Recklebe of Bad Pyrmont, Lower Saxony,

Germany.

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ASAL   Arid and Semi-Arid Lands

EFA   Education for All

ESP   Economic Stimulus Programmes

ICT   Information and Communication Technology

ICT4E   Information and Communication Technology for Education

KESSP   Kenya Education Sector Support Programme

KICD   Kenya Institute of Curriculum Development

KNBS   Kenya National Bureau of Statistics

MDG   Millennium Development Goals

MOEST   Ministry of Education, Science and Technology

NACOSTI   National Commission for Science, Technology and Innovation

OECD   Organization for Economic Co-operation and Development

SPSS   Statistical Package for the Social Science

TAM   Technological Acceptance Model

UNCTAD   United Nations Conference on Trade and Development

UNESCO   United Nation Education and Scientific Cultural Organization

UNICEF   United Nations Children Education Fund

Abstract

Information and Communication Technology (ICT) became a vital educational tool intended to achieve quality and equity in curriculum implementation mainly at the school level in Kenya. The acquisition of 21st century pedagogical skills depended on availability of teachers with suitably training in ICT integration and equipped with adequate ICT infrastructure for sustainable implementation of curriculum at the classroom environment. The teachers however seemed generally reluctant to integrate ICT in teaching and learning even though the Ministry of Education, Science and Technology (MOEST) offered ICT facilities to a selected number of public secondary schools. This study therefore aimed at providing significant information on teacher factors influencing ICT integration in teaching and learning in public secondary schools in Samburu North Sub-County. The study sought to investigate an extent to which training of teachers, age of teachers, experience of teachers, gender of teachers and attitude of teachers influence ICT integration in teaching and learning. The research project was guided by a descriptive survey design. The target population constituted 60 teachers, 6 deans of study and 6 principals of public secondary schools in Samburu North Sub-County. The target population was sampled and selected using cluster and judgement sampling procedures. The research instruments used were a questionnaire and an interview schedule. A descriptive statistics was used to analyse data and presented on tables, pie charts, bar graphs and calculated using percentages as well as weighted mean with the help of SPSS. Besides, a qualitative data was presented through descriptive statistics. The key findings of the study indicated that training of teachers influenced an extent to which teachers accessed and used technologies in teaching and learning. The study had therefore found that training teachers on ICT integration could enhance competency and self-efficacy to utilize the new technologies. The study also found that young teachers aged less than 30 years were found to be more interested in technologies while teachers aged above 30 years were less enthusiastic to access and use technologies. The study thus concluded that teacher age determines the level of adoption and usage of ICT in the classroom. The study moreover found that length of teachers' work experience in teaching service did not considerably influence ICT integration in teaching and learning. The study recommended the MOEST to offer student-teachers with adequate practical teaching using instructional technologies. The study also found that teacher's gender, either male or female, influenced ICT use in teaching and learning. The study revealed that male teachers were able to access and use computers in teaching activities more than female teachers. The study thus recommends the MOEST to offer full scholarships to equal number of men and women enrolled in ICT-related courses. On attitude, the findings revealed that teachers had positive attitude towards ICT integration in classroom activities. The study recommended that the MOEST should train teachers on ICT integration and supply ICT facilities to schools to encourage regular use of instructional technologies in classroom practices.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

The integration of Information and Communication Technology (ICT) in teaching-learning processes heightens the need to offer learners the so-called 21st Century competencies. Kler (2014) identified ICT as an effective medium with ability to improve instructive communication between the teacher and the learner in a classroom furnished with appropriate educational technologies. Since the year 2005, the demand for ICT integration in the curriculum has become a global concern and of great significance towards achieving the Millennium Development Goals (MDGs) and Education for All (EFA) goals. This is to say that developed and developing countries are putting extra efforts to integrate ICT in classroom interactions and management of information systems.

In Europe, ICT integration in education has been prioritised as a vital tool for pedagogical innovation and knowledge transformation across the curriculum. In Bangladesh, teachers have been slow to adopt and use ICT in teaching due to challenges related to lack of time for lesson preparation, teachers' negative attitudes towards ICT and corruption at the managerial level of education sector. In Germany, ICT integration in pedagogy was not fully adopted in schools because of inadequate trained teachers on ICT integration in subject-related technology. The teachers have positive self-efficacy to use technology but have little knowledge on new pedagogical approaches that differ from traditional methods of teaching (OECD, 2014; Salhberg, 2010; UNESCO, 2005).

The Sub-Saharan Africa countries are at the threshold of investing significant resources (material and human) in new digital technologies (Hennessy, Harrison & Wamakote, 2010). The low level of ICT skills therefore exposes teachers to a significant technological innovation as the process of adopting and using ICT in teaching-learning processes. Besides, the challenges loom especially concerning teachers' willingness and self-confidence to use ICT tools in pedagogy (Kurga, 2014).

In Kenya, ICT integration in teaching and learning was meant to transform the nation into knowledge-based economy. For viability of ICT integration strategies, the Government of Kenya established ESP to generate and to distribute digital content for public secondary school (Hennessy et al. 2010; Republic of Kenya, 2013). At the same time, the National ICT Innovation and Integration Centre were set up in order to carry out technical support on ICT infrastructure (Republic of Kenya, 2014). The government has also come up with Kenya National ICT Policy (2006) and the Kenya National ICT Master Plan 2013/14 – 2017/18 to guide educational stakeholders in the introduction of ICT infrastructure in public secondary schools countrywide. The ICT project was aimed at equipping a selected number of schools with ICT infrastructure. The ICT for Education (ICT4E) was also established to guide teachers ICT integration in daily classroom practices (Republic of Kenya, 2013).

Samburu North Sub-County is categorised as ASAL zone in the northern part of Kenya. The sub-county headquarter is Baragoi, a township with a population of about 31,043, 16,296 male and 14,747 female (Republic of Kenya, 2009).   The local community experiences a tremendous gender disparity attributed to African culture and this influences enrolment of boys and girls in schools. The secondary schools in

Samburu North Sub-County often experience high school dropout rate at 17% of the total enrolment per annum attributed to people cultural practices and mindset toward girls' education. The illiteracy index is 27% of the total population with inability to read, write and speak in English and Kiswahili (Republic of Kenya, 2009 Census).

In a report for Communications Commission of Kenya, Apoyo (2011) stipulated a statistical evidence to demonstrate challenges facing all Counties in Kenya regarding adoption and use of Information and Communications Technologies (ICTs). According to Apoyo (2011) six Counties in Kenya recorded low internet users include Samburu County (1.9%), Marsabit County (1.6%), Turkana County (1.6%), Wajir County (1.5%), West Pokot County (1.5%) and Mandera County (1.2%). Apoyo (2011) had documented people's access to internet in Samburu County, that is, in own house (0.17%); in education centres (0.16%); on mobile phones (0.49%). This shows a low percentage of people accessing computers and internet in Samburu County. Apoyo (2011) further confirmed that 0.42% of population in Samburu County do not have knowledge in ICT and internet connectivity, while 0.22% of the population rely on commercial cyber cafés to browse internet and typesetting text-based document. These data imply that civil servants (including teachers) working in public sector in Samburu North Sub-County have little self-efficacy regarding integration of Information and Communication Technologies in their daily businesses. Based on this background, this study seeks to investigate teacher factors influencing integration of ICT in teaching-learning processes in public secondary schools in Samburu North Sub-County, Kenya.

1.2 Statement of the Problem

The Government of Kenya has substantially invested considerable resources in education reforms by supplying secondary schools with ICT facilities and training of teachers on ICT integration in the curriculum. In the year 2011, the MOEST provided computers to public secondary schools in phases under the KESSP. There were 4,000 secondary schools targeted countrywide for provision of ICT infrastructure for provision of ICT infrastructure. For successful ICT integration project, the MOEST targeted approximately 300 Trainers of Trainers and 150 ICT Champions for training on ICT. At the end, 1,500 secondary schools received ICT facilities and 1,609 teachers were trained on ICT integration in teaching-learning.

In spite of being trained in ICT integration, teachers in public secondary schools in Samburu North Sub-County appeared constantly hesitant to incorporate ICT in classroom activities. Basically, Ajzen, (2005) pointed out that lack of user acceptance and cynical attitudes towards ICT integration in teaching and learning were the underlying barriers to successful achievement of a new information system in education.

1.3 Purpose of the Study

The purpose of the study was to investigate teacher factors influencing integration of Information and Communication Technology (ICT) in teaching in public secondary schools in Samburu County, Kenya.

1.4 Objectives of the Study

The objectives of the study were:

i)   To establish how training of teachers influence ICT integration in teaching and learning in public secondary schools in Samburu North Sub-County.

ii)   To determine the influence of teachers' age on ICT integration in teaching-learning processes in public secondary schools in Samburu North Sub-County.

iii) To examine the extent to which teachers' experience influence ICT integration in teaching-learning in public secondary schools in Samburu North Sub-County.

iv)   To establish the extent to which gender influences the use of ICT in teaching-learning in public secondary schools in Samburu North Sub-County.

v)   To examine how teachers' attitudes influence ICT integration in teaching-learning in public secondary schools in Samburu North Sub-County.

1.5 Research Questions

The research questions for the study were:

i)   To what extent would teachers' level of ICT training influences effective integration in the curriculum?

ii)   To what extent do teachers' ages influences ICT integration in teaching and learning?

iii) In which way does teachers' experience in ICT influence effective integration in the curriculum?

iv)   To what extend to gender influences the use of ICT in teaching-learning in public secondary schools in Samburu North Sub-County?

v)   To what level would teachers' attitudes toward ICT influence effective integration in teaching and learning?

1.6 Significance of the Study

The findings and the recommendations of this study could serve as a guiding tool for effective adoption and use of educational technologies in teaching-learning processes. With the help of this study, the subject teachers, the deans of studies and the school administrators may in turn be able to make informed decisions on how to effectively implement ICT integration in a classroom environment. Based on the findings, the study may highlight challenges facing teachers in the process of using technologies in classroom as well as in private operations and suggest future remedies. The education planners, curriculum developers and policy makers can also make use of the findings and recommendations of this study. These stakeholders could focus not only on strengths and opportunities of ICT integration programme but also on its weaknesses and threats including challenges hampering ICT integration in pedagogy.

Basically, improving teacher development strategies was directly or indirectly helps to improve learners' performance in ICT-related courses and in other subjects. The study therefore becomes a guiding instrument to improve future ICT policies, ICT-based content and syllabuses and ICT-based Teacher training programmes in Kenya.

The study could also assist the Ministry of Education to improve monitoring and evaluation instruments based on the recommendations of this study pertaining to teacher characteristics such as attitude, skills, experience and gender, among others. The Ministry of Education, Science and Technology was able to focus on capacity building programmes for teachers through in-service and pre-service programmes. The knowledge gap recommended by the study could open an opportunity for future research. The researchers were either to improve the existing study or create new knowledge on ICT integration in pedagogy for the benefit of the entire society.

1.7 Limitations of the Study

A limitation is a factor that presents possible shortcomings of the study that cannot be controlled by the researcher and the investigator, nevertheless, needs to be aware of their limitations (Cohen, Manion & Morrison, 2007). The study was affected by banditry commonly in a form of cattle rustling and shooting vehicles on the road. The researcher therefore hindered from accessing respondents in schools situated in distant remotest areas such as P.C.E.A. Tuum Girls' Secondary School and Baragoi Day-Mixed Secondary school. In order to solve this problem, the researcher delivered the questionnaires using police patrol fleets to deliver the questionnaires and administered interview schedules to the respondents.

1.8 Delimitations of the Study

The delimitations are the restrictions set by the researcher to mark the scope of the study (Cohen, Manion & Morrison, 2007). This study was purposely restricted to teacher factors influencing ICT integration in teaching-learning in public secondary schools in Samburu County. According to Samburu County Implementation Plan

(2013-2017), there are 19 public secondary schools in the larger Samburu County with a total of 185 teachers in these public secondary schools. The area of study was thus be narrowed to Samburu North Sub-County to avoid conducting the study in the entire Samburu County. This enabled the researcher to manage the collection and analysis of data within a given time limit. The narrowing of area of study and selection of respondents helped the researcher to reduce the cost of the study in the entire Samburu County. For this reason, this study was restricted to six public secondary schools in Samburu North Sub-County, focusing on 60 teachers to investigate factors influencing ICT integration in teaching.

The study was therefore determined to investigate an extent to which teacher's training in ICT, teacher's age, teacher's experience in teaching, gender-related factors and teacher's attitudes towards ICT influenced its integration in daily classroom activities.

1.9 Assumptions of the Study

The following are assumptions of this study.

i) Regardless of age and sex, all teachers were assumed to be capable of using ICT in teaching and learning;

ii) The respondents were assumed to be willing and honest to respond to the items in the questionnaires as expected.

1.10 Definitions of Significant Terms

Age refers to the number of years that a teacher lived since he or she was born.

Attitude refers to individual teacher's thinking, behaviour and feelings towards ICT integration in teaching and learning. Attitude comprises of emotions or actions of teachers toward technology in daily classroom practices.

Gender refers to gender refers to the socially constructed, rather than the biologically defined, sex roles and attributes of females and males.

ICT gap refers to limited access to ICT services and tools, with either high cost of access or low demand in relation to the population.

ICT integration refers to a range of learning opportunities from a stand-alone technology in a classroom environment where lessons are conducted by a teacher using ICT tools installed with instructional softwares.

Intervening Variable refers to a variable that comes in between other variables and assists to delineate the process through which Independent and dependent variables affect one another.

Teaching Experience refers to competencies, knowledge and skills that a teacher possesses acquired from a long period of in teaching profession in line with training obtained in teacher training programmes.

Training of Teachers refers to teacher Education programmes, mostly pre-service, where teachers acquire competencies and skills needed in a particular subject of specialization.

1.11 Organisation of the Study

This study is organised into five chapters.

Chapter one deals with introduction which discusses the background of the study, statement of the problem, purpose of the study, objectives of the study, research questions, significance of the study, limitations and delimitations of the study, Assumptions of the study, definition of terms, and organization of the study.

Chapter two deals with review of related literature, which involves a detailed discussion of the available study based on the objectives of this study. The summary of literature and research gap, theoretical framework and conceptual framework conclude this chapter.

Chapter three covers research methodology covering research design, target population, sample size and Sampling procedure, research instruments, validity and reliability of research instruments, data collection procedures, data analysis techniques and ethical considerations.

Chapter four concentrates on data analysis, interpretation and discussions of the study, while chapter five gives a summary, conclusions and recommendations of the study as well as suggestions for further research.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Introduction

This chapter deals with a review of related literature on teacher factors influencing ICT integration in teaching-learning in public secondary schools in Samburu North Sub-County. The literature review considers the influence of teachers' level of training, teachers' age, teachers' experience, teacher's gender and attitude on adoption and use of ICT in the curriculum. This chapter further deals with a summary of knowledge gap, theoretical and conceptual frameworks.

2.2. Teachers' Training and ICT Integration

The availability of trained teachers has been globally considered as a key strategy for advancement of the new technological innovation in the curriculum (OECD, 2004). Training teachers on ICT integration helps to provide them with competencies and skills of how to incorporate ICT tools in their respective subjects in the classroom environment (Gaible, Bloome, Schwartz, Hoppes and Vota, 2011). Sahlberg (2010) noted that deficiency of teacher development programmes in Finland influence integration of ICT in teaching and learning processes. In India, the use of Information and Communication Technologies (ICTs) is limited because of low number of adopters especially among female teachers. A report by OECD (2014) revealed that 19% of teachers were trained in ICT, while 18% of teachers were able to access and use ICT in their private and professional activities. This shows a very low number of teachers with ICT skills and potential to access ICT tools to prepare lessons based on suitable application softwares (Rastogi and Malhotra, 2013; Vyas-

Doorgapersad, 2014). The Global Campaign for Education (2012) noted that an absence of women teachers accessing and using the new technologies in secondary school was worsened by a challenge of inadequate training of female teachers.

One of the challenges facing ICT integration initiative has been related to inadequate teachers trained in ICT integration in pedagogy. In an article published in Exhibitor Magazine (2014), Munene Henry affirms that teacher development programmes are necessary to overcome any kind of resistance. The teacher development programmes in Finland indicated that about 63% of teachers neither have ICT skills nor access and use computers (Norrag, 2013). In a study conducted in West Africa, Vyas-Doorgapersad (2014) found that training of teachers in the new technology was hampered mainly by inadequate ICT skills and facilities. The MOEST trains teachers of Mathematics and Sciences ICT integration under CEMASTEA programmes. The trainings were meant to be part of teacher motivation and induction for adequate preparation to integrate ICT in the curriculum. Through in-service training, teachers gain technological experience and knowledge through lessons that require them to define, design and solve learning problems in classroom scenarios (Mishra & Koehler, 2007).

However, Mwathi (2014) noted that Kenya is facing a significant shortage of trained teachers to implement ICT integration in the curriculum along with a challenge of inadequate ICT infrastructures in public secondary schools. Shazia, (2000) found that despite having few certificates in computer packages, few teachers were capable of using computers in their personal and professional work. The available study had therefore recommended that teachers need to acquire practical skills and competencies in instructional technologies in order to attain the educational

demands of 21st century (Norrag, 2013; United Nations, 2014; Vyas-Doorgapersad, 2014). Shazia (2000) further suggested that training teachers to serve as technology experts could support integration of technologies into the classroom practices.

In another instance, Semenow (2005) posited that acquirement of ICT facilities had created a great challenge to teachers due to the cost of electronic machines such as computers, digital cameras and projectors. As a result, the Government of Kenya had visualized to setting up a Universal Service Fund (USF) for ICT sector to subsidise the cost and to ease access of ICT infrastructure rollout in underdeveloped regions. The USF for ICT was also established to train human resources, teachers included, in the technology (Kenya National ICT Policy, 2006). Finally, Shazia M. (2000) had provided an explanation that ICT integration training enables teachers to match what subject content and pedagogy with suitable application software.

2.3 Teachers' Age and ICT integration

A related literature reviewed depicted that age affects teachers' effective adoption and use of the new technology in teaching and learning (UNESCO, 2014). Chemwei & Koech (2014) found that young teachers in the age bracket of 25-30 years seem to have higher interest in ICT. The young teachers show a great of enthusiasm in the adoption and use of computers in their private and in public life. The older generation of teachers, therefore, experienced challenges when using ICT in teaching-learning (Guoyuan, 2010).

Salhberg (2010) argued that senior Finnish teachers trained in ICT integration develop their confidence to higher levels than colleagues coming to it more recently,

without training in ICT integration. In Cyprus, teachers who began using computers at the ages of 40's or 50's face great difficulty to understand computer language or computing commands. Kusano, Frederiksen, LeAnne and Kobayashi (2013) found that age determined teachers' usage of ICT in teaching and learning. This attested that teacher's age influences the use of ICT integration in classroom practices (Kurga, 2014). Peeraer and Petegem (2011) argued that age of a teacher can influence utilization of ICT in teaching among teachers particularly those who were either born in the world of technologies or late adopters who accessed technologies most recently.

2.4 Teachers' Experience and ICT Integration

The Kenya National ICT Master Plan 2013/14 – 2017/18 states that the professional development outcomes after about three years of experience are not homogeneous and determined by a particular employer. According to Chemwei, Njagi and Koech (2014), the experience of teachers has a considerable influence on adoption and use of technology in daily classroom activities. An experience in teaching plays an important role for effective integration of ICT in curriculum delivery. Deen-Swarray, Gillwald, and Morrell (2012) stated that teachers with extensive teaching experience were aged and therefore a low self-efficacy in access and ease of use of ICT tools in classroom activities. The adoption and use of ICT in teaching and learning is easily influenced by a period of time in which the teacher served in teaching. The teachers who served in teaching profession for long period tend to have no interest in ICT (Mulwa & Kimosop, 2015). As cited in Dix (2007), Nash and Moroz (1997) found that teachers with more computer experience had greater confidence in their ability to use computers effectively.

In a study to assess integration of ICT in instruction in teacher education institutions in Kenya, Chemwei, et al. (2014) found that a teacher experienced in subject content and pedagogy but without adequate knowledge in technology was relatively incompetent in integration of ICT in teaching and learning. This indicates that the gap between highly experienced and less experienced teachers has been determine by a recruiting agencies or government ministries. Chemwei et al. (2014) further found that teachers in the age bracket of 41-50 years and above in teaching profession faced challenges of using computers. This implies that teachers with fewer years in teaching profession are enthusiastic, skilled and interested in the use of ICT tools in teaching and learning processes. In a review of related literatures, Dix (2007) had however supported the idea that earlier-career teachers had more positive views towards ICT use in teaching and learning than recent-career teachers.

Mulwa and Kimosop (2015) found that the length of service of teachers in teaching profession influences the use of ICT in daily classroom activities. The teachers with 1-5 years of experience in teaching have substantive readiness to adopt and use ICT in teaching unlike teachers with more years of experience but without interests and skills in technology. However, Onwuagboke, Singh and Ngozika (2014) posited that the number of years of teaching experience of a teacher has a direct relationship with use of ICT in teaching. This entails the fact that the more experienced the teachers are, the more they readily use technology in teaching and learning processes. As cited in Onwuagboke et al. (2014), a study by Rahimi and Yadollahi (2011) established no connection between ICT integration and teachers' years of teaching experience.

2.5 Gender of Teachers and ICT Usage

Although technology is growing very fast, access to internet and use of personal computers is mostly hampered by gender digital divide particularly in education sector. The gender digital divide was viewed as a globally emerging issue that could influence effective adoption and use of ICT in teaching and learning (UNCTAD, 2014). With regards to adoption and usage of technologies in education, Akbaba and Kuruback (1998) had noted that developed nations showed swift diminishing gender digital gap between men and women. In Senegal, being a developing African nation, women's technological literacy rate remains significantly low (38.7%) whereas men's technological literacy rate is around 61.8% in 2009 (UNESCO Institute of Lifelong Learning, 2014). The female teachers therefore fail to pursue Information Technology (IT) or other related careers because of a misconception that views technology as men's career (Guoyuan, 2010). This is a challenge attributed to gender stereotyped that perceived technology to be more appropriate for a particular sex, mainly males (Bukaliya & Mubika, 2012). Similarly, Rimyan (2006) investigated gender differences in ICT experience and literacy among trainee teachers. The study also revealed significant differences between males and females in technical ICT capabilities, and situational and longitudinal sustainability where males' scores were higher. In her Ph.D Thesis report, Dix (2007) cited that male teachers had more confidence about ICT use than female teachers. In reference to Chalmers and Price (2000), found that a number of inequities are faced by female teachers with regards to ICT use, gender stereotype and lower self-efficacy in the use of ICT tools in teaching and learning.

In Kenya, nearly 72% of the people use smart phones but nearly 32% are frequent internet users. The UNESCO Institute of Lifelong Learning (2014) reported that inadequate ICT courses in teacher training programme in Kenya is most likely to be a contributing factor limiting progress in education. For that reason, the female teachers barely get time to use computers because of they spend greater parts of their time tending to household chores (Dorothy, Elishiba, & Wango, 2014; UNCTAD, 2014). Rather and Kuraishy (2014) attributed slow rate of ICT integration in the curriculum to teachers' factors, particularly the gender aspect, in terms of male and female. In comparison with the male teachers, the female teachers fail to access computers due to inadequate time of use and technical skills to use and repair a computer. A related study by Dorothea, Hollow and Pevuda (2014) documented that gender discrimination begins from early schooling when parents favour and offer boys better opportunities than girls. This became a challenge of gender digital divide that emerged from parents who educate boys more than girls and hence increase disparity in the use of computers between male and female (Alalgawi, Sulaiman, Rosnafisah & Norshakirah, 2014).

The ICT Policy Making in East Africa (2005) stated that although subject teachers pursue introduction to computers focusing on application software and hardware packages, they were not capable of integrating or significantly apply technological knowledge in teaching and learning activities. This could have contributed the extent to which female teachers remained at the lowest level of ICT adoption and use in pedagogy (Gaible, Bloome, Schwartz, Hoppes and Vota, 2011). Evidently, the existing information and communication services were still inaccessible and too expensive to women (UNCTAD, 2014). Despite successful

integration of technologies in the curriculum, gender disparity becomes a de-motivating factor, which inhibits female teachers working especially in underprivileged public secondary schools from adopting and using ICT in daily classroom activities. According to Omollo, Indoshi and Ayere, (2013), teachers' readiness to adopt and use technologies in teaching vary from one sex to another; between male and female teachers. Oyeniyi and Adetimirin (2013) found that less than 25% of teachers used ICT in teaching and learning and thus indicated a low rate of adopters of instructional technologies. Alternatively, Semenow (2005) recommended that technology oriented policies had transformed gender distribution and opportunities at the workplace and subsequently facilitated both men and women to work in an ICT enabled environment.

2.6 Influence of Teachers' Attitude on ICT Integration

Ajzen (2005) defined attitude as a predisposition to respond favourably or unfavourably to an object, an idea or a new innovation. Omollo, Indoshi and Ayere (2013) found that males had slightly more positive attitude toward ICT use than females. The integration of ICT in the curriculum has been affected by teachers' attitude. Gode, Obegi and Macharia (2014) found that male teachers held favourable attitude towards use of computers than female teachers. Researchers such as Kurga (2014), Mwathi (2014), Mingaine (2013) uncovered that positive attitude towards new technology did not predict ICT integration. They added that teachers' positive attitude towards technologies did not significantly influence teachers' perceived ability and intentions to integrate and use ICT in classroom activities. Concurrent with this view, Rastogi and Malhotra (2013) argued that teachers' positive attitude towards

new technology did not significantly influence their perceived ability and intentions to integrate ICT in pedagogy. Shazia (2000) had also found that teachers with positive attitudes towards technologies were positively inclined towards using ICT in the classroom activities.

In a study conducted to determine factors militating against the introduction of computer education in secondary schools in Zimbabwe, Bukaliya and Mubika (2012) found that majority 66%) of respondents cited that teachers had a negative attitude towards use of ICT in education. This means that teachers had not appreciated contribution of technologies in delivery of content in classroom environment. A similar study by Birgit (2011) established that negative attitude of female teachers towards technology obstructs them from effective integration of ICT in teaching and learning processes.

To end with, Vanderlinde and Braak (2011) noted that since teachers had never used ICT tools in teaching, it would be useful to embark on more appropriate measures and initiatives in order to improve teachers' attitudes towards implementation of curriculum through technologies. This was confirmed by Guoyuan (2010) who noted that emerging need for instructional technologies with 21st century skills can promote equal career prospects in technologies for male and female teachers.

2.7 Summary of Literature

This study concurs with Rastogi and Malhotra (2013) who found that trained teachers demonstrated competency in use of technology in teaching and learning. The findings indicated that teachers with ICT skills in computer applications were

able to develop lesson notes and present in classroom with great technological competency. In an Exhibitor Magazine (2014), Munene Henry affirms that integration of ICT in teaching and learning depends on teacher training on instructional technologies.

On ages of teachers, this study concur with a study conducted by Chemwei and Koech (2014) on assessment of Information and Communication Technology (ICT) integration in instruction in teacher education institutions in Kenya. The findings revealed that young teachers aged less than 30 years demonstrated high self-efficacy and enthusiasm in the use of new technologies in teaching and learning unlike old teachers who do not use computers in their daily teaching and learning activities. In line with Chemwei and Koech (2014), this study concluded that young teachers, aged below 40 years, were competent and interested in the usage of computers unlike old teachers above 40 years of age who were not incompetent and unskilled in the use computers in their private and teaching activities.

The findings revealed that the length of work experience of teachers did not influence ICT integration in teaching and learning. The findings therefore differ with a study by Mulwa and Kimosop (2015) who argued that work experience of the teachers influence adoption and usage of technologies in teaching and learning. In line with Rahimi and Yodollahi (2011), this study found that the length of work experience did not have any connection with ICT integration in classroom activities. For this reason, the findings of this study indicated that the length of work experience for the teacher had significant influence in teachers' ability and readiness to use technology in the classroom environment.

According to The gender of teachers was found to have considerable influence on ICT integration in teaching and learning. The findings of this study match up with the ICT Policy Making in East Africa (2005) which indicated that a small number of female teachers pursue ICT courses. This study agrees with Omollo, Indoshi and Ayere (2013) who found that female teachers fail to use computers for their daily private and professional activities. The study therefore found that female teachers barely access and use ICT tools to prepare for presentation of their lessons. The findings concur with a study conducted by Dorothy, Elishiba and Wango (2014) on gender-related challenges faced by students in learning technical courses in Machakos Technical Training Institute. The study revealed that the gender of teachers, being female or male, to some extent, influence teachers' readiness to adopt and use technologies in teaching and learning.

On attitude of teachers, the findings agree with Vanderlinde and Braak (2011) in a study on defining and predicting teachers' perceptions of innovation attributes depicting that the female teachers held negative attitude towards adoption and usage of ICT tools in teaching and learning. The findings of this study agree with Guoyuan (2010) in a Ph.D. thesis research project conducted on teacher characteristics and ICT integration in China. Similar to Guoyuan's (2010) study, this study found that the attitude of teachers can thus be improved through training, motivation and providing purchase of adequate ICT facilities for the schools.

2.8 Theoretical Framework

This study was based on the theory of Technological Acceptance Model by Davis, Bagozzi and Warshaw (1989).

Figure 2.1: Technology Acceptance Model
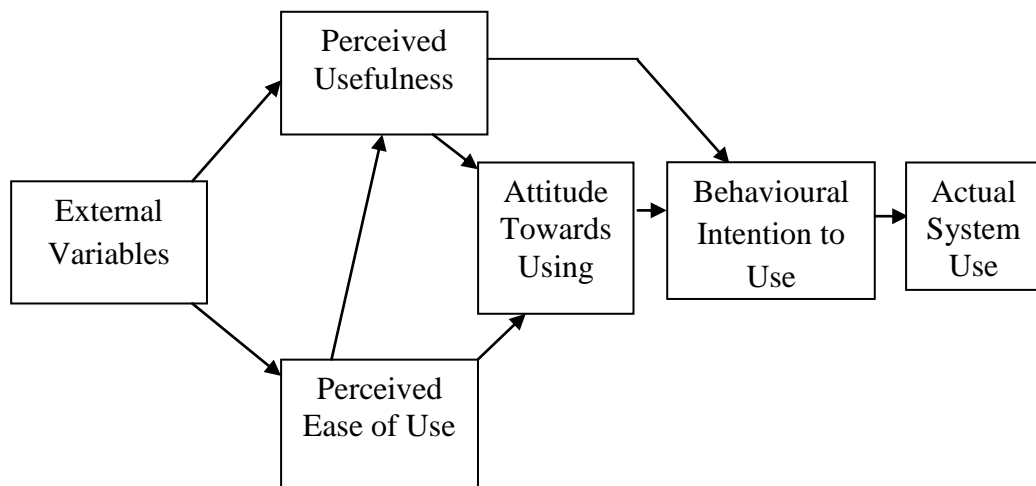
(Source: Davis, Bagozzi & Warshaw, 1989)

This theory presents a basis for mapping out the effects of external variables on internal beliefs, attitudes and intentions of the user towards a new technology. Davis et al. (1989) formulated two more theories under the Technological Acceptance Model: Perceived Usefulness (PU) and Perceived Ease of Use (EOU). The Perceived Usefulness is seen as potential user's personal probability to see the benefits and value of an innovation. The Perceived Ease of Use refers to an extent to which the potential adopters expect a new technology to be easy to use and to integrate it in daily classroom practices. These theories are relevant to this study because they predict concealed behaviours, motivation and intentions of the teachers toward adoption and use of ICT in teaching and learning processes.

2.9 Conceptual Framework

Mugenda and Mugenda (2003), define a conceptual framework as a hypothesized model classifying the variables under investigation and their relationships.

Figure 2.2 A Diagrammatic Relationship between Teacher Factors and ICT Integration


```
┌─────────────────┐
│ TRAINING OF     │
│ TEACHERS        │
└─────────────────┘

┌─────────────────┐
│ AGES OF         │
│ TEACHERS        │              ┌──────────────┐      ┌─────────────────────┐
└─────────────────┘              │ TEACHING     │      │ ICT INTEGRATION     │
                                 │    &         │ ──►  │ • No. of teachers   │
┌─────────────────┐       ──►    │ LEARNING     │      │   owning computers  │
│ EXPERIENCE OF   │              └──────────────┘      │ • No. of teachers   │
│ TEACHERS        │                    ▲               │   using ICT tools   │
└─────────────────┘                    ┆               │ • No. of teachers   │
                                       ┆               │   trained in ICT    │
┌─────────────────┐                    ┆               │ • No. of Teachers   │
│ GENDER OF       │             ┌ ─ ─ ─┆─ ─ ─ ─ ─ ┐    │   using digital     │
│ TEACHERS        │               • National ICT       │   content           │
└─────────────────┘             │   Policies       │   └─────────────────────┘
                                  • School
┌─────────────────┐             │   Administration │
│ ATTITUDES OF    │                 Support
│ TEACHERS        │             │ • ICT            │
└─────────────────┘                 Infrastructure
                                │   in School      │
                                └ ─ ─ ─ ─ ─ ─ ─ ─ ─┘
```
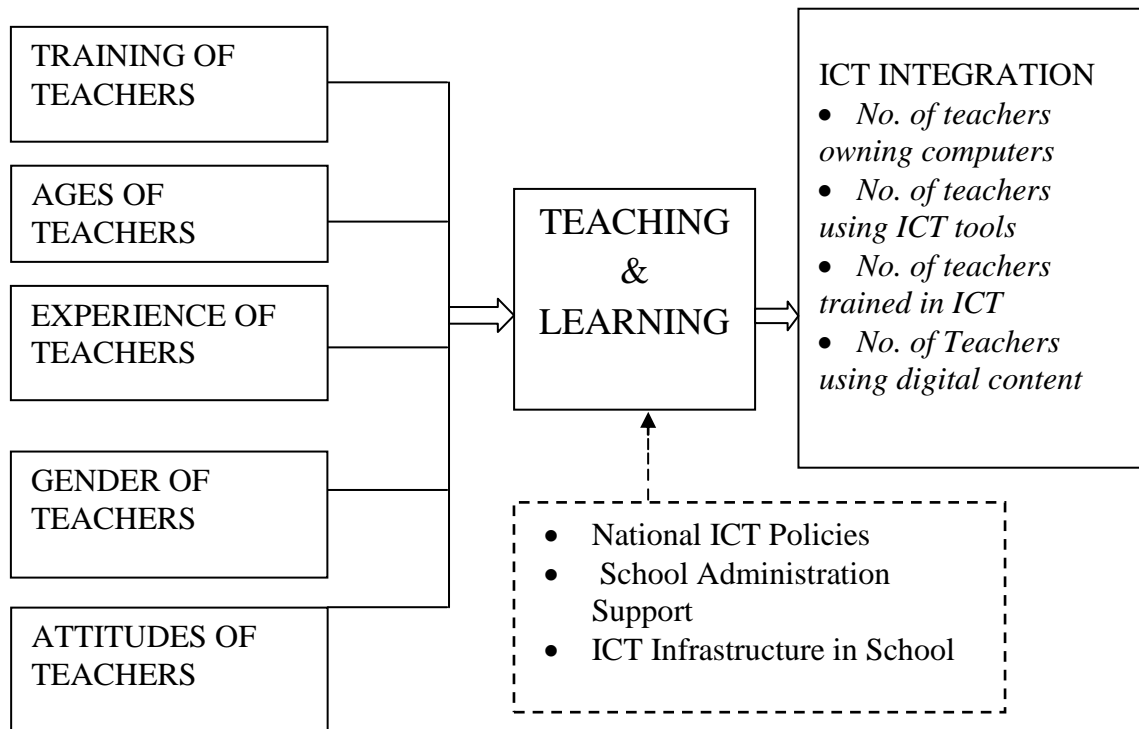
(Adopted from: Davis, 1993)

Figure 2.2 shows inputs involved in the study including teachers' training, age of teachers, experience of teachers in teaching, gender related factors and attitude of teachers towards perceived benefits and use of ICT integration in pedagogy. The dependent variable is the outcome caused by the independent variables.

In this case, the conceptual framework for this study seeks to sketch a roadmap of causality from teacher factors through change of attitude or intention to actual adoption and use of technology integrated in classroom practices (Davis, 1993, 1989). These outcomes include number of teachers possessing laptops, number of teachers using computers in teaching and number of teachers trained in ICT integration.

The intervening variables can indirectly influence ICT integration in teaching and learning. The National ICT policies (2014), the Kenya National ICT Master Plan 2013/14 – 2017/18, level of support from the school administration and availability of ICT infrastructure are examples of the intervening variables, which may indirectly influence magnitude of ICT integration in daily classroom activities.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter outlines thematic divisions such as the research design, study location, target population, sample size and sampling procedure, research instruments, validity and reliability of the instruments, data collection techniques, data analysis techniques and ethical considerations.

3.2 Research Design

Orodho (2004) defined research design as the arrangement of conditions to conduct research; this is, for collection and analysis of data. The study used descriptive survey design, which was useful in collection of statistical data for in-depth study of teacher factors influencing ICT integration in daily classroom practices. The study employed a mixed method comprising quantitative and qualitative approaches suitable for questionnaires as research instruments to collect in-depth data on teacher factors influencing ICT integration in teaching (Creswell, 2003; Kenya Institute of Management Training Series, 2011). The quantitative approach enabled the researcher to collect statistical data while qualitative approach collected descriptive data for in-depth analysis of teacher factors influencing ICT integration in teaching in public schools in Samburu North Sub-County in Kenya.

3.3 Target Population

The target population of this study comprised of teachers of public secondary schools in Samburu North Sub-County. The records in District Education Officer in Samburu North Sub-County showed that 6 public secondary schools with a total of 60 teachers where 47(78.3%) were male teachers and 13(21.7%) were female teachers. the study focused also on 6 school principals and 6 Directors of Studies (DoS) to obtain information on administrative involvement in ICT integration in teaching and learning.

3.4 Sample Size and Sampling Procedure

According to Mugenda and Mugenda (2003), sampling is the process of selecting a manageable number of individuals with potential to represent the large group of individuals from which they were selected. On the other hand, Gay (1998) argued that a minimal sample of 10% to 20% of the population which could be satisfactorily representative. The sample size of this study therefore consisted of 60 teachers, 6 Heads of Technical Department and 6 school principals working in six public secondary schools in Samburu North Sub-County, Kenya.

The researcher thus used cluster sampling and judgement sampling procedures appropriate to select teachers in Samburu North Sub-County focusing on teacher factors such as level of training in ICT, ages of teachers, their experiences in teaching profession, gender-related factors and attitude of teachers towards ICT integration in teaching and learning.

Table 3.1

Sampling Framework

SCHOOLS	Male	%	Female	%	Total
Nyiro Boys	11	**18.3**	4	**6.7**	**15**
Baragoi Boys	12	**20.0**	2	**3.3**	**14**
Baragoi Day-Mixed	5	**8.3**	1	**1.7**	**6**
Baragoi Girls	9	**15.0**	4	**6.7**	**13**
P.C.E.A. Tuum Girls	4	**6.7**	1	**1.7**	**5**
Nyiro Girls	6	10.0	1	1.7	7
TOTALS	**47**	**100**	**13**	**100**	**60**

The judgment sampling procedure, also referred to as purposive sampling procedure was finally useful to select a sample of public secondary school teachers in Samburu North Sub-County by reason of accessibility issues, costs and researcher's need for specific variables in a selected sample size.

3.5 Research Instruments

The Questionnaire and interview schedule were used to collect data on teacher factors influencing Information and Communication Technology (ICT) integration in teaching-learning processes in public secondary schools in Samburu North Sub-County. Questionnaire was appropriate for this study because it was cost-effective to collect data from many respondents at the same time without engaging the researcher in too much movement from one respondent to the other (Borg, 1998). The respondents were also able to fill in information in anonymity to avoid an avoidable fear of victimization.

An interview schedule was chosen to collect details of abstract information that could not easily be brought out by the questionnaire. Preferably, interview schedule was more useful because of its ability to collect in-depth qualitative data based on questioning interviewee for verifications and clarifications of issues. The questionnaire for teachers had sections marked alphabetically, mainly A to G with serialized items to cover the themes based on the objectives of this study. There were closed ended and open ended questions to guide the respondents in collection of quantitative data. The interview schedule intends to generate qualitative data for in-depth investigation in spite being subjective in nature. The open-ended questions provided structured statements which require explanations, description and personal comments about an item of inquiry. The questionnaires and interview schedule were used concurrently.

3.6 Validity of Instruments

Validity of a research instrument is the extent to which a research instrument measures what it was designed to measure, whose validity was examined by the experts in the area of study (Kothari, 2004; Mugenda and Mugenda, 2003; Orodho, 2009). The research instrument was piloted by administering questionnaires to a random sample of teachers from a single school. The results were used to make valuable judgement especially on content validity to ensure that it was in concordance with the objectives it was designed to measure (Kothari, 2004). The grammatical errors were corrected to avoid ambiguity in statements. The content validity of the items in the questionnaire and the interview schedule was validated by consulting the supervisors of this study under the University of Nairobi (Kimberlin & Winterstein,

2008). This enabled the researcher to obtain professional commentaries and modification of the research instruments.

3.7 Reliability of Research Instruments

According to Cohen, Manion and Morrison (2007), reliability is an extent to which an experiment, test or any measurement procedure yields the same results on repeated trials. Reliability is also defined as the degree of consistency, whether the instrument was reliable and dependable to collect valid data (Cohen et al., 2007; Kothari, 2004). The researcher also used the split-half method where the total number of items was divided into two halves to observe a linkage existing between the two halves. This correlation estimated the reliability of each half of the test. The researcher used statistical adjustment to estimate the reliability of the two tests (Carmines & Zeller, 1979; Kimberline et al., 2008). The research instruments for this study was subjected to testing method that uses a single instrument administered to a group of individuals at the same period of time (Carmines & Zeller, 1979; Creswell, 2003; Kothari, 2004). The reliability coefficient of the responses was calculated using the Pearson's Product Moment Correlation Coefficient (r) formula:

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

In Karl Pearson's product moment correlation coefficient formula, the value of '*r*' lies between ±1.0 (Kothari, 2004). Mugenda and Mugenda (2003) expounded on reliability coefficient, which vary between positive and negative values. Generally, +1.0 of '*r*' indicates positive correlation between the two variables and this means

that changes in both variables take place in the statement direction. The negative values of '*r*' indicate negative correlation implying that changes in the two variables took place in the opposite directions. The researcher tested the research instrument and obtained positive values of *'r'* indicating positive correlation co-efficient between the two variables (Kothari, 2004; Mugenda & Mugenda, 2003). The piloting results arrived at a +5.0 correlation coefficient, which implied that the research instrument was reliable.

The researcher had therefore modified the research instrument so as to eliminate the inconsistencies in themes and grammatical errors to achieve content validity. This involved a process of developing and validating an instrument focusing on reducing errors for effective study of teacher factors influencing ICT integration in teaching in public secondary schools in Samburu North Sub-County.

3.8 Data Collection Procedure

After obtaining approval from the supervisors, the researcher proceeded to obtain a research permit from the National Commission for Science, Technology and Innovation (NACOSTI). While in the field, the researcher sought permission from the Director of Education based in Maralal, the Teachers Service Commission County Director based in Maralal and the District Education Officer stationed at Baragoi in Samburu North Sub-County. At the school level, the researcher sought authorization from the school principals and consent from individual respondents to ensure them confidentiality.

3.9 Data Analysis Techniques

Data analysis involves processing raw facts, figures and numerals into meaningful information by sorting, coding, cleaning and processing and interpreting data (Cohen, Manion & Marrison, 2007). In this study, the researcher planned the layout of the questionnaire for ease of analysis using serialized numbering method.

The data were analyzed using descriptive statistics. A quantitative data collected from closed-ended questionnaire items was scored and presented using descriptive statistics in form of percentages, tables and charts (Creswell, 2003). The quantitative data was categorised and organized based on objectives of the study for analysis using Statistical Package for Social Sciences (SPSS), version 20. A qualitative data collected from interview schedule was analysed, interpreted and presented descriptively. Then data entry began including sorting, encoding and interpreting into meaning in reference to the objectives of the study as organised in the questionnaire. The analysed data was interpreted and presented on bar graphs, pie charts and tables to enhance efficiency of the study (Cohen et al. 2007).

3.10 Ethical Considerations

The Oxford Advanced Learner's Dictionary (8th Edition) defines the word ethical as something morally correct or acceptable. In research, the researcher was imperatively expected to collect and use the data from the respondents in a morally acceptable way. The researcher had also maintained the respondents' privacy with undue confidentiality and not collecting the respondent's personal life information. The collection of data was the best stage to minimise chances of infringing on personal space and violating individual's rights and freedom. In order to avoid unethical conduct in data collection, the researcher strived not to reveal names, residence or addresses of the participants that may ultimately cause social damages to their personal lives or to their families. Basically, observing the privacy of the respondents helps the researcher to create rapport, obtain trust and inspire the respondents to willingly and voluntarily give honest responses. Last but not least, the researcher observed the underlying objectives of the study and use the data in accordance with intended purpose (of this study) but not for personal interests.

CHAPTER FOUR

DATA ANALYSIS, INTERPRETATION AND DISCUSSIONS

4.1 Introduction

This chapter dealt with analysis, presentation and interpretation of data and discussions based on the objectives as arranged on the questionnaires and interview schedule. The study sought to investigate teacher factors influencing Information and Communication Technology in teaching and learning in public secondary schools in Samburu North Sub-County, Kenya.

4.2 Questionnaires Return Rate

Table 4.1 shows the rate of response for this study was considerably satisfactory when levelled with the challenge of insecurity affecting the respondents in the Samburu North Sub-County. According to Mugenda and Mugenda (2003), a response rate above 50% is adequate for the researcher to make informed conclusion.

Table 4.1

Questionnaires Return Rate

Questionnaires	Teachers		Dean of Studies		Principals	
	F	%	F	%	F	%
Total No. Issued	60	100	6	100	6	100
No. Returned	44	73.3	5	83.3	4	66.7
No. Not Returned	16	26.7	1	16.7	2	33.3

Out of the 60 teachers sampled, 44(73.3%) filled and returned the questionnaires, while 16(26.7%) of the respondents did not return the questionnaires. On the other hand, the number of questionnaires administered to Deans of Study and school principals were each 6 in total but 5(83.3%) and 4(66.7%) returned respectively.

4.3 Demographic Information of the Respondents

The general demographic information of the respondent was collected, which included the gender, age and academic qualifications of the respondents.

4.4 Gender Distribution of the Respondents

The study focused on the gender representation of the respondents using the questionnaire and the interview schedule. The results are presented in Figure 4.1.

Figure 4.1 Gender of the Respondents
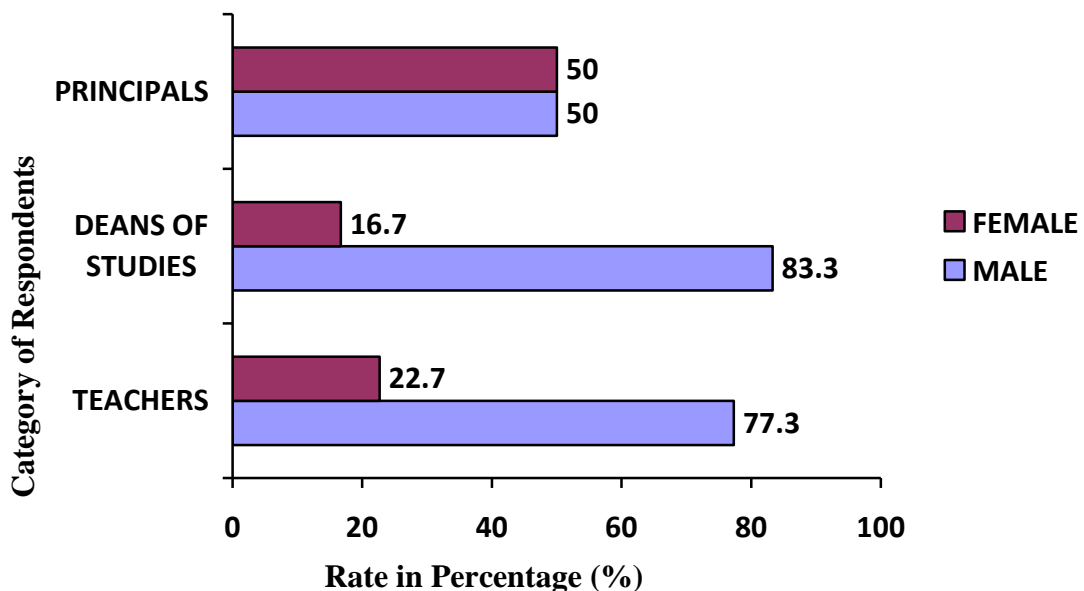
Figure 4.1 indicates that both gender, male and female, were equally represented and the study did not focus on a single gender.

The findings revealed that male teachers were the majority 77.3% while female teachers were the minority (22.7%) in a sampled selected for this study. The gender of the deans of study comprised of 83.3% males and 16.7% females. The school principals were equally distributed by gender accounted as 50% male principals for the 3 boys' schools and 50% female principals for the 3 girls' school. This information helped the researcher to obtain a general gender description of respondents to avoid gender bias in conclusions and recommendations of the study.

4.5 Age Distribution of the Respondents

The preliminary items asked the respondents to state their individual ages selected within specified categories of age brackets as summarised in Table 4.2.

Table 4.2

Age Distribution of the Respondents

	Teachers		Deans of Study		Principals	
AGES	No.	%	No.	%	No.	%
Less than 30 year	27	61.4	1	20	0	0
31-40 years	17	38.6	4	80	3	75
41-50 years	0	0	0	0	1	25
50 years & above	0	0	0	0	0	0
Total	**44**	**100**	**5**	**100**	**4**	**100**

The findings in Table 4.2 reveal that majority (61.4%) of the teachers were in their active youthful age, less than 30 years; and 38.6% were middle aged, 31-40 years. Besides, 80% of the Deans of Studies and 75% of the school principals were middle aged, in their prime age in teaching profession.

However, only 25% of the school principals aged above 40 years, approaching their retirement from practising teaching in secondary schools. The ages of teachers illustrate the degree of participation of teachers in their teaching activities depicting that a large number of teachers were still in their active age in teaching profession. This information helped the researcher to determine their level of participation in integration of ICT in teaching and learning. On comparison, the findings agree with Rimyan (2006) who argued that young teachers perceived instructional technologies as more suitable unlike senior teachers who viewed technology as difficult to use.

4.6 Respondent's Academic Qualifications

The study sought to establish academic qualifications in order to verify respondents' competencies in ICT integration in teaching and learning as presented in Table 4.3.

Table 4.3

Distribution of Respondents' by Academic Qualifications

	Teachers		Deans		Principals	
Qualification	No.	%	No.	%	No.	%
Diploma	6	13.6	1	20	0	0
B.ED	34	77.3	4	80	4	100
M.ED	1	2.3	0	0	0	0
M.SC	1	2.3	0	0	0	0
PGDE	1	2.3	0	0	0	0
Others	1	2.3	0	0	0	0
Total	**44**	**100**	**5**	**100**	**4**	**100**

The majority of teachers (77.3%), Deans of Studies (80%) and school principals (100%) attained Bachelor of Education (B.ED), while those with Masters Degree, Master of Science (M.SC), Post Graduate Diploma in Education (PGDE) and others qualifications accounted for 2.3% each. On the other hand, 13.7% of teachers and 20% of Deans of Studies attained Diploma in teacher education. Table 4.3 showed that the highest number of respondents attained Bachelor of Education degree. The findings agree with report by United Nations (2014) which emphasised that a great number of teachers were trained enabling ease to use technology based pedagogy in classroom activities. However, the findings disagree with Rastogi and Malhotra (2013) that a very low number of teachers were trained for effective use of technology in teaching and learning.

The Kenya National ICT Master Plan 2013/14 – 2017/18 proposed training of teachers in ICT to provide the 21st century skills for sustainable implementation of instructional technologies in schools. Moreover, this study match up with Mishra and Koehler (2007) who suggested that teachers require ICT training to enable them to develop fundamental knowledge of technology in general and to build up ICT proficiency. The ICT training therefore can facilitate teachers to link pedagogy and content knowledge using technology in teaching and learning contexts.

4.7 Training and Integration of ICT in Teaching and Learning

The study investigated the relationship between training of teachers and adoption of ICT in teaching and learning.

4.7.1 Training and ICT Integration in Teaching and Learning

The data were collected to ascertain whether training of teachers influence ICT integration in relation to readiness to adopt and utilize ICT tools in teaching and learning. The responses were summarised in Table 4.4.

Table 4.4

Training and ICT Integration

Need for Training	Frequency (f)	Percentage
Yes	31	70.5%
No	11	25%
Not Sure	2	4.5%
Total	**44**	**100%**

According to the findings, 70.5% of the respondents indicated that training of teachers influence teachers' readiness to use ICT in teaching, 25% did not agree while 4.5% were not sure. The findings agree with the Kenya National ICT Policy (2006) Article 2.4(a), which emphasised that training of teachers on ICT integration in curriculum can promote acquisition of skills and confidence. According to Mishra and Koehler (2007), the training of teachers in ICT can help them to develop skills and to integrate Technological, Pedagogical and Content Knowledge (TPACK) in the classroom environment.

4.7.2 Teachers and ICT Training

The study gathered information about the number of teachers with ICT training. This aimed at establishing the extent to which teachers' prior training in ICT integration influences adoption and use of ICT in teaching and learning. The findings of the study showed that 63.6% of teachers were not trained in ICT integration while 36.4% were trained in ICT. This shows that the high number of teachers were not skilled on instructional technological knowledge for ease of use in curriculum delivery.

The findings agree with the Kenya National ICT Master Plan 2013/14 – 2017/18 that training teachers is critical for them to acquire 21st century skills for ease of integration of ICT in teaching and learning. This study agree with Gaible et al., (2011) who argued that schools in East Africa were faced with a challenge of inadequate and poorly trained teachers in ICT. On general observation from the interview sessions, the researcher noticed that schools offering Computer Studies as a compulsory subject did not have teachers trained in ICT. The students were taught by untrained teachers or paraprofessionals on contract terms.

4.7.3 Availability of Teachers Trained in ICT Integration

The study also sought information whether ICT training or workshops were available for and attended by teachers. According to the findings of the study, majority of respondents (52.2%) confirmed that in-service training of teachers in ICT integration was not available, 36.4% cited absence of ICT integration workshops for secondary school teachers, while 11.4% of the respondents were not sure of the availability of ICT workshops in Samburu North Sub-County. The findings agree

with Mwathi (2014) who found that severe scarcity of teachers trained in ICT integration hamper effective implementation of curriculum embedded on instructional technologies in Kenya.

4.7.4 Teacher and In-Service Training in ICT

The researcher sought information on the number of teachers who have participated ICT workshops. The responses are summarised in Figure 4.2.

Figure 4.3 Teachers and In-Service Training in ICT
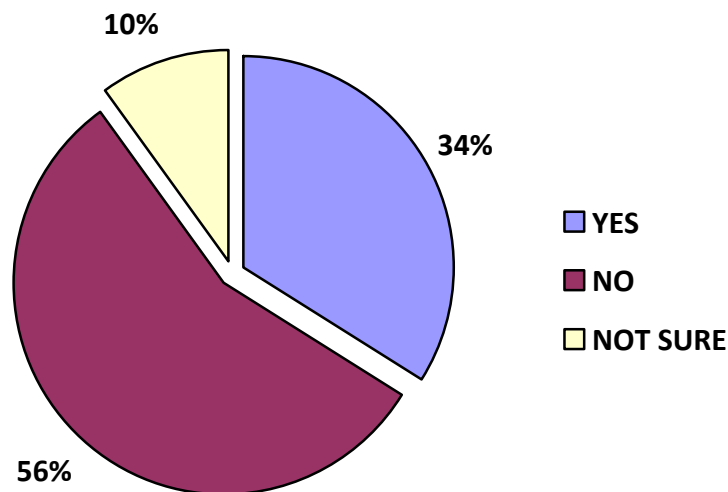
Figure 4.3 indicate that the majority (56%) of the respondents indicated that ICT integration workshops were not attended by teachers to attend, while 34% agreed of teachers' participation in in-service training. An additional 10% of teachers were not aware of any available ICT integration workshops held for specifically for secondary schools teachers. The findings further found that teachers who attained highest level of education as well as those with ICT training were able to use the new technology in classroom performance. In line with Vyas-Doorgapersad (2014), the findings revealed that in-service training of teachers has significant influence on

extent to which teachers incorporate technology into pedagogy in order to deliver digital content with suitable learning outcomes. The findings further agree with Munene Henry in his article published in Exhibitor Magazine (2014) affirming that in-service training of teachers has significant influence on extent to which teachers integrate technologies into pedagogy in order to deliver digital content to achieve expected learning outcomes. Based on the findings, this study agree with Shazia (2000) who established that training of teachers, to some extent, influences integration of ICT in teaching and learning.

4.8 Age and Integration of ICT in Teaching and Learning

The study was conducted to establish the age bracket of teachers who were predominantly accessing and using computers in their professional and private.

4.8.1 Age Distribution of the Respondents

The study focused on age as a contributing factor influencing effective ICT integration in teaching and learning. The age distribution was shown in Table 4.5.

Table 4.5

Distribution of the Respondents' Ages

	Teachers		Dean of Studies		Principals	
Age Brackets	F	%	F	%	F	%
Less than 30 year	27	61.4	1	20	0	0
31-40 years	17	38.6	4	80	3	75
41-50 years	0	0	0	0	1	25
50 years & above	0	0	0	0	0	0
Total	**44**	**100**	**5**	**100**	**4**	**100**

The study revealed that majority 27(61.4%) of teachers were aged less than 30 years, while those aged between 31-40 years were 17(38.6%). The majority 4(80%) and 3(75%) of the Deans of Study and school principals, respectively, were aged 31-40 years. These findings found that majority (61.4%) of young teachers were exposed to the new technologies in teaching while 38.6% of older teachers accessed ICT in teaching and learning processes. The findings agree with Peeraer and Petegem (2011) who argued that age of teachers has significant influence on integration of ICT in teaching and learning processes.

4.8.2 The Age of Teachers Mostly Accessing and Using Computers

The teachers sampled in this study cited that age of a teacher influences access and use of computers in classroom practices. The information presented in Table 4.6 provides respondents' responses on age bracket of teachers regarding access to and use of ICT tools such as a Personal Computer (PC), LCD projectors, digital cameras and smart phones to prepare and to present a digitized subject content to the learners.

Table 4.6

Ages of Teachers Mostly Accessing and Using Computers

Ages of Teachers	Frequency (f)	Percentage
Below 30 years	26	59.1%
31-40 years	14	31.8%
41-50 years	2	4.5%
Over 51 years	2	4.5%
Total	**44**	**100%**

The findings of the study found that majority (61.4%) of the respondents aged below 30 years had consistent access and use of computers in their private and professional activities. The teachers aged between 31-40 years (29.5%) slightly access and use computers while teachers aged 41-50 years and above 4.5% indicated a negligible access and use of computers in teaching and learning. These findings were back by Guoyuan (2010) who found that the young teachers highly accessed and used ICT tools as opposed to the old generation of teachers who experienced challenges of access and limited practical skills to use ICT tools in their private as well as in their teaching activities.

4.8.3 Old Teachers and Attendance of In-Service Training

The study sought information whether old teachers do not attend in-service training on ICT integration in teaching and learning and the responses provided using Likert-type scale as shown in Table 4.7.

Table 4.7

Old Teachers and Attendance of In-Service Training

Ages of Teachers	Frequency (f)	Percentage
Strongly Agree	11	25.0%
Agree	21	47.7%
Not Sure	8	18.2%
Disagree	4	9.1%
Strongly Disagree	0	0%
Total	**44**	**100%**

The findings in Table 4.7 indicate that majority (47.7%) strongly agree that old teachers rarely attend in-service training on ICT integration; while 25% of the respondents agree that old teachers do not attend ICT integration training. On the contrary, 9.1% disagreed with the statement that old teachers did not attend in-service training in ICT integration in teaching and learning. This indicates that old teachers were not actively involved in ICT integration training unlike young teachers with great enthusiasm to use technologies in classroom activities. On contrast, the findings of this study disagree with Salhberg (2010) who posited that senior Finnish teachers were considerably trained in ICT integration than young teachers who enter into teaching profession without adequate training in ICT integration in teaching and learning.

4.8.4 Age of Teachers Mostly Attending in-Service ICT Training

The study sought to collect information pertaining age of secondary school teachers who mostly attend in-service training on ICT integration in Samburu North Sub-County. The responses are summarised in Table 4.8.

Table 4.8

Age Brackets of Teachers Attending ICT Training

Ages of Teachers	Frequency (f)	Percentage
Below 30 years	21	47.7%
31-40 years	14	31.8%
41years & Above	0	0%
None of the above	9	20.5%
Total	**44**	**100%**

The findings indicate that majority (47.7%) of the respondents aged below 30 years and those aged between 31-40 years (31.8%) attended ICT training and have adequate skills in ICT integration in teaching. However, Table 4.8 indicates that 20.5% of the respondents stated that none of the age brackets of teachers attended ICT training in Samburu North Sub-County. The findings agree with studies conducted by Kurga (2014) that age of a teacher determines teacher's readiness to access and use the ICT tools and digital media as an effective platform for delivery of curriculum to the learners.

4.8.5 The Age of Teachers with ICT Training during Pre-Service Training

The researcher moreover sought to examine the age of teachers that mostly received ICT training during pre-service training and responses are summarised in Table 4.9.

Table 4.9

Ages of Teachers and Pre-Service Training

Ages of Teachers	Frequency (f)	Percentage
Below 30 years	26	59.1%
31-40 years	5	11.4%
41years & Above	3	6.8%
None of the above	10	22.7%
Total	**44**	**100%**

The respondents indicated attendance of pre-service teacher education programmes for majority of teachers 26(59.1%) in an age range below 30 years, 5(11.4%) in age bracket of 31-40 years and 3(6.8%) of teachers aged above 41 years attended ICT training during pre-service teacher programmes. A fraction of 10(22.7%) deny of any available number of teachers trained in ICT during pre-service teacher education programme.

The findings of this study agree with Chemwei and Koech, (2014) and the Kenya National ICT Masterplan 2013/14 – 2017/18, (2014), those young teachers had categorically acquired adequate skills in instructional technology and media practicals in pre-service training and teaching practice sessions mainly for effective delivery of digitalized content in the classrooms.

4.9 Teachers' Experience and ICT Integration

The study sought to establish an extent to which teachers' experience in teaching profession influences adoption and use of ICT integration in teaching and learning.

4.9.1 Teachers' Experience in Teaching Profession

The researcher sought to information on the length of time spent by each respondent in teaching profession and the responses are shown in Table 4.10.

Table 4.10

Teachers' Experience in Teaching and Learning

Ages of Teachers	Frequency (f)	Percentage
Less than 10 years	34	77.3%
11 – 20 years	7	15.9%
21 – 30 years	3	6.8%
31 – 40 years	0	0%
Over 40 years	0	0%
Total	**44**	**100%**

The findings of this study found that majority (77.3%) of public secondary school teachers were in teaching profession for less than 10 years. This study revealed that many respondents were newly recruited into teaching profession, while 15.9% have taught in a period ranging between 11-20 years and 6.8% have been in teaching profession for a period of 21-30 years. The results of the study therefore indicate that teachers with few years of work experience in teaching demonstrated higher self-efficacy and intentions to use computers in their private and teaching activities. The findings concurred with Onwuagboke, Singh and Ngozika (2014) who opined that work experience has little influence to access and usage of technologies in teaching and learning.

4.9.2 Time that Teachers began Using ICT Tools

The study sought to determine the duration of time in years spent by teachers using computers and other technologies in teaching. Table 4.11 presents a length of time during which teachers accessed and used computers.

Table 4.11

Time that Teachers began Using ICT Tools

Ages of Teachers	Frequency (f)	Percentage
Less than 10 years	29	65.9%
11 – 20 years ago	15	34.1%
21 – 30 years ago	0	0%
Over 31 years ago	0	0%
Not at all	0	0%
Total	**44**	**100%**

According to the findings, 65.9% of the respondents confirmed that their first time to access and to use ICT tools was in a period less than 10 years, while 34.1% of the respondents showed an insignificant access and use of computers. The findings therefore agree with Rahimi and Yadollahi (2011) who found that teaching experience had little influence to accessibility and usage of the instructional technologies in teaching and learning. The findings further agree with Onwuagboke et al. (2014) that young teachers highly access and use ICT tools for their private and teaching activities. However, this study disagrees with Dix's (2000) study on the impact of ICT

adoption on students and teachers that experienced secondary school teachers are more likely to adopt ICT-rich teaching practices in the classroom environment.

4.9.3 Last Time Teachers Used Computers in Teaching

The researcher sought to find out the last moment that a teacher used a computer in teaching and the responses are summarised in Table 12.

Table 4.12

Last Time Teachers Used Computers in Teaching

Ages of Teachers	Frequency (f)	Percentage
Less than 10 years	31	70.5%
11 – 20 years ago	0	0%
21 – 30 years ago	0	0%
Over 31 years ago	0	0%
Not at all	13	29.5%
Total	**44**	**100%**

The findings indicate that 70.5% of the respondents used computers in teaching in a period of less than 10 years while 29.5% of the respondents have never used computers in teaching. The findings agree with Guoyuan (2010) that the ages of teachers influences effective use of ICT tools in teaching and learning. The study confirmed that old teachers rarely show interest in the use of computers to develop and present lesson content in the classroom. These findings were therefore consistent with a study by Apoyo (2011) who found that the inhabitants of Samburu County,

including teachers scarcely use computers as well as challenge of limited access to internet services.

4.10 Gender and Usage of ICT In Teaching and Learning

The researcher sought information on how gender-based factors affect ICT integration in teaching and learning processes.

4.10.1 Gender that Commonly Own and Use Computers

The researcher sought to know whether each gender own and use computers in teaching and learning processes. The responses are summarised in Figure 4.3.

Figure 4.4 Gender that Commonly Own and Use Computers
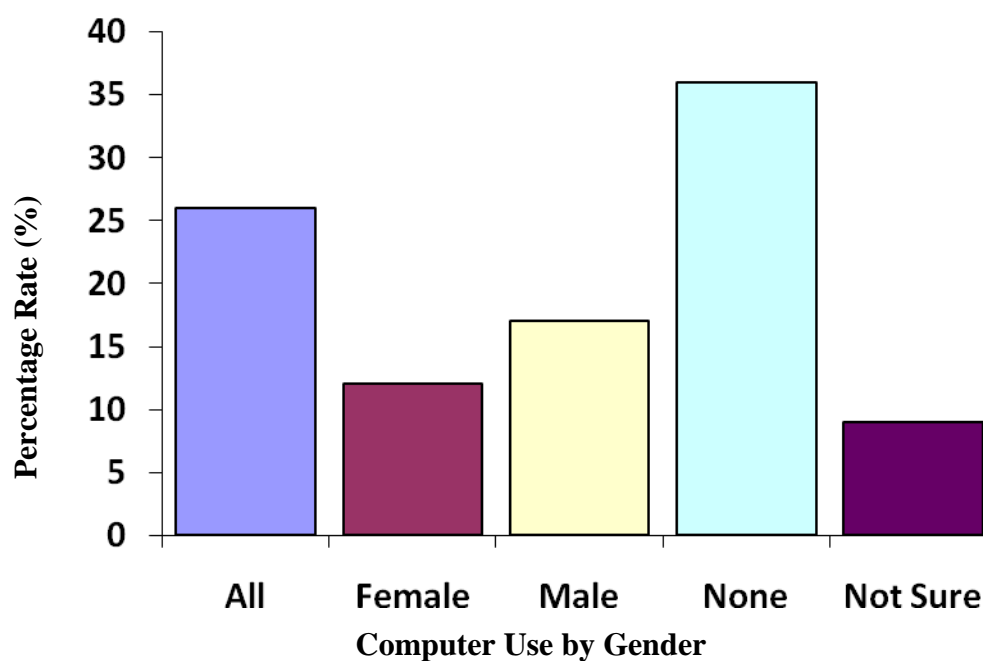
These findings in Figure 4.4 indicated that majority (36%) of the respondents cited that none of the gender owned computers. These findings concurred with Semenow (2005) argued that both male and female teachers readily adopted and used technology in their workplace hence reduced the gender digital gap. On the other hand, 26% of the respondents cited that all genders, males and females, owned and used computers; and 12% indicated that females owned computers; 17% indicated that males own computers, while 9% was not sure.

The findings agree with Omollo, Indoshi and Ayere (2013) and Birgit (2014) who argued that male teachers had slightly more positive attitude toward ICT use than female teachers. Besides, the findings are in agreement with Gode, Obegi and Macharia (2014) who cited male teachers as the gender that held favourable attitude towards usage of computers than female teachers.

The findings indicate that the rate at which female teachers use computers in school to prepare lessons or for personal activities was very low compared with male teachers. This study further concurs with Guoyuan (2010) who found that female teachers can hardly pursue ICT in education as their core career unlike male teachers.

4.10.2 Addressing Gender Digital Divide in ICT Integration

The study sought to assess ways to address gender digital divide in ICT integration in teaching and learning. The results are presented in Table 4.13.

Table 4.13

Addressing Gender Digital Divide

Statement	Frequency	%
Training all teachers	11	27.3%
Give equal opportunities to all teachers	7	15.9%
Motivate all teachers	5	11.4%
Incorporate ICT in curriculum	7	15.9%
Avoid gender discrimination in ICT	5	11.4%
Create awareness on ICT integration	3	6.8%
Purchase Computers for Schools	4	9.1%
Not Sure	2	4.5%
TOTAL	**44**	**100%**

The findings of the study agree with Norrag (2013) who found that training teachers to acquire skills on instructional technology and media practicals was a prerequisite approach to promote efficiency and self-efficacy among teachers in the process of integrating ICT in daily teaching and learning.

Moreover, the findings concur with Ministry of ICT 2013-2017 Strategic Plan which recommends for the creation of public awareness about importance of ICT Integrate ICT in education in order to familiarise young Kenyans with the 21st century technologies as tools for teaching and learning.

The findings further agree with UNESCO Life Long Learning (2014) and Akbaba and Kuruback (1998) having cited that training all teachers in ICT integration could be a viable means to address gender digital bias between male and female teachers.

4.11 Teachers' Attitude towards ICT Integration in Teaching and Learning

The researcher sought to establish teachers' attitude towards ICT integration in teaching. This is because the attitude of teachers towards ICT integration plays a significant role as a predictor of utilization of ICT tools for their professional as well as for private activities.

4.11.1 Teachers' Attitude towards ICT Integration in Teaching

The study examined teachers' attitude attitudes toward integration of ICT in teaching. The results are summarised in Table 4.14. The responses gave comparison of positive and negative items to find out a dominant stance among the respondents towards usage of Information and Communication Technologies (ICTs) in teaching and learning. The findings of this study disagree with Bukaliya and Mubika (2012) having revealed that teachers' attitude towards ICT integration in teaching was positive (i.e. weighted mean above 3.0) especially in readiness to discuss about ICT integration in their subjects with colleagues and a strong believe that ICT can give suitable content with suitable learning experiences.

The findings agree with Gode, Obegi and Macharia (2014) who found that teachers held positive attitude towards ICT integration in teaching and learning. Based on the findings, it suffice to surmise that a weighted mean of 2.8 and 2.9 indicate an inadequate teachers' confidence in using computer softwares to present concepts in their subjects. The findings further agree with Bukaliya and Mubika (2012) who found that the teachers with negative attitudes towards ICT were less capable of using computer and were therefore less likely to adopt and use instructional technologies than the respondents with positive attitudes.

Table 4.14

Teachers' Attitude towards ICT Integration in Teaching

STATEMENT	SA F	%	A F	%	D F	%	SD F	%	Weighted Mean
I feel confident to use suitable software to present concepts in my subject area.	23	52	9	21	8	18	4	9	**2.8**
I often discuss with other teachers about ICT integration in a subjects.	10	23	15	34	14	32	5	11	**3.5**
I am assured that Internet gives suitable content with suitable learning experiences.	19	43	15	34	6	14	4	9	**3.0**
The use computer in designing and presenting content are not easy for me.	12	27.2	10	22.7	10	22.7	12	27.2	**4.0**
The computer is unreliable because of technical problems in a lesson.	13	29.5	6	13.6	14	31.8	11	25	**3.7**
I feel demoralized when I fail to fix small computer malfunction in lessons.	7	13.6	11	20.5	17	15.9	9	20.5	**3.6**

Basically, the negative attitudes towards ICT enhanced barrier to effective integration of ICT in teaching and learning. However, these findings were against the study by Vanderlinde and Braak (2011) that teachers held negative attitude towards classroom environment embedded on instructional technologies.

4.11.2 Places Where Teachers Access Internet Services

In one item, the researcher sought to find out whether place of internet access had relationship with attitude of teachers in ICT integration in teaching and learning.

The findings indicated that majority 14(31.8%) of the respondents accessed and browsed internet on their personal smart phones; 9(20.5%) accessed and browsed internet at the cyber cafés; 8(18.2%) access and browsed using friend's computers; 7(15.9%) accessed and browsed internet at their homes; while 6(13.6%) accessed and browsed internet in school. This study found that teachers had irregular access to internet services and use of digital content in school environment.

The findings therefore were at variance with Semenow (2005) and Shazia (2000) who laid great emphasis on equal distribution of technological opportunities to every individual at the workplace. In daily practice, teachers opt to avoid operating computers perhaps because of inadequate skills or low attitude towards the role of ICT in teaching and learning.

4.11.3 Improving and Changing Teachers' Attitude

The researcher sought to establish ways to improve teachers' attitude towards ICT integration in teaching and the responses are summarised in Table 4.15.

Table 4.15

Suggestions to Improve and Change Teachers' Attitude

Statement	Frequency (f)	Percentage
Train teachers on ICT	21	47.7%
ICT to be a compulsory subject	8	18.2
Motivate teachers with allowances and certificates	7	15.9%
Provide enough ICT resources in schools	6	13.6%
Introduce E-learning in schools	2	4.5%
Total	**44**	**100%**

The majority (65.9%) of the respondents indicated that training of teachers in ICT integration can improve their attitude towards ICT integration in teaching. Another 15.9% cited that teachers should be motivated with allowances and certification; 13.6% recommended provision of adequate ICT resources in schools.

Besides, 4.5% of the respondents suggested that Electronic Learning (E-Learning) can improve teachers' access to and usage of technology in teaching and learning. These findings correspond with Vanderlinde and Braak (2011) who recommended for the need to adopt more appropriate measures in order to improve teachers' attitudes towards the new technology and integration in the mainstream curriculum instructional. In daily practice, teachers opt to avoid operating computers perhaps because of inadequate skills or low attitude towards the role of ICT in teaching and learning. These results disagree with Rastogi and Malhotra (2013) who

argued that teachers' positive attitude towards new technology did not significantly influence their perceived ability and intentions to integrate ICT in pedagogy. The findings further agree with Dix (2007) who cited that ICT can improve ways of teaching – change of teaching methodology.

4.11.4 Causes of Teachers' Attitude toward ICT Integration

The researcher sought to find out the respondents' outlook on possibly factors inhibiting teachers' attitude towards ICT integration utilization in teaching and learning even when computers are available in school. The responses are summarised in Figure 4.5. The majority (52.3%) of the respondents cited lack of skills in ICT as the major factor inhibiting teachers from using ICT integration in teaching. This percentage (52.3%) shows that effective adoption and use of computers in teaching was determined by the level of skills in ICT. The findings further show that 18.2% asserted that use of ICT tools was time-consuming and cumbersome. The results agree with Vyas-Doorgapersad (2014) who cited that training of teachers plays a major role to instil hand-on skills for effective adoption and usage of instructional technologies in the classroom environment.

Figure 4.5 Challenges facing Teachers in Utility of ICT Tools
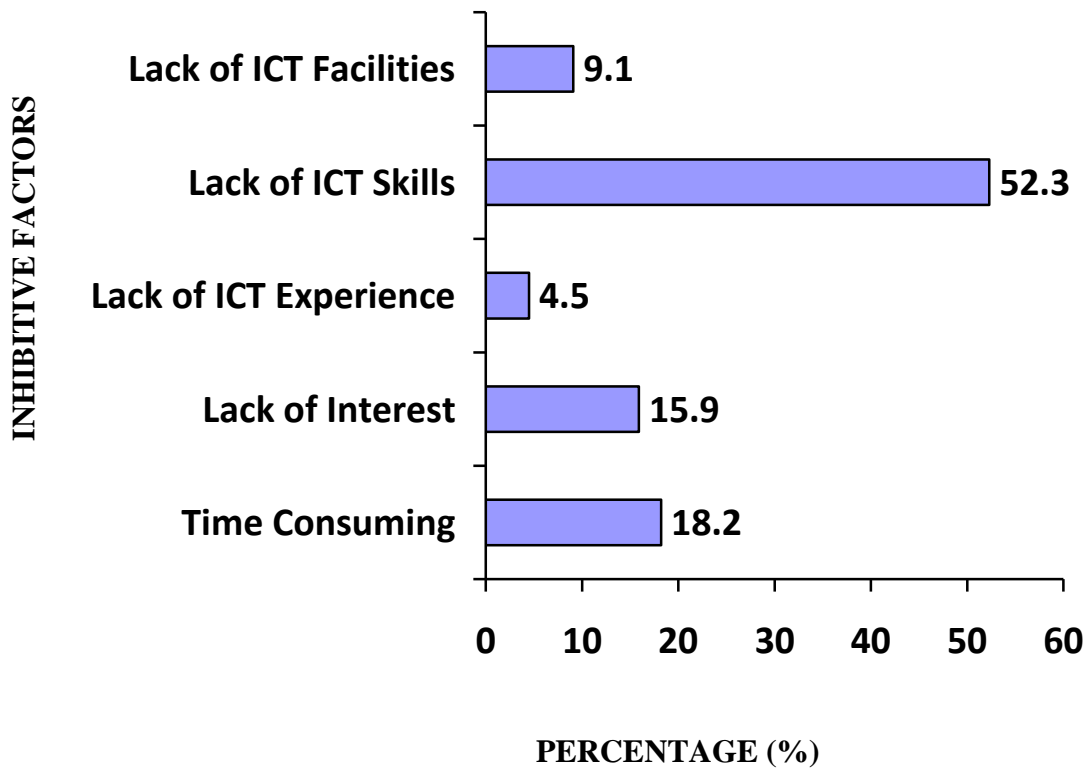
In addition, the findings of this study go along with the study by Kyalo and Nzuki (2014) who found that training of teachers on ICT integration helps to build positive attitudes toward Technological, Pedagogy and Content Knowledge (TPACK) to match the technological changes. Based on Figure 4.5, the findings further found that 9.1% of the respondents cited that ICT facilities have been inadequate for all teachers; 15.9% cited lack of interest and negative attitude towards ICT integration obstructed teachers from adopting ICT integration in Teaching, while 4.5% pointed out lack of experience in ICT hampered effective use of ICT in teaching despite availability of computers in schools.

Generally, teachers with ICT skills demonstrate interest in usage of Microsoft Word and Microsoft Power Point presentation to plan, develop and present content to the learners using relevant ICT tools. In relation to the above challenges, Alalgawi, Sulaiman, Rosnafisah and Norshakirah (2014) conducted a study factors affecting teachers' attitude towards adoption and use of ICT into teaching and learning in Iraq education system. The findings therefore agree with Semenow (2005) and Shazia (2000) who posited that inadequate training of teachers and unavailability of ICT facilities inhibit effective access and use of instructional technologies in teaching and learning.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter outlines a summary, conclusions and recommendations of the study as well as suggestions for further research.

5.2 Summary of the Study

The study focused on teacher factors influencing integration of ICT in teaching and learning in public secondary schools in Samburu North Sub-County in Kenya. The objectives of the study endeavoured to investigate the extent to which teacher factors such as training, age, work experience, gender and attitude influence integration of ICT in teaching and learning. The study was based on Technological Acceptance Model (TAM) formulated by Davis, Bagozzi and Warshaw in 1989. The sub-theories within TAM include Perceived Usefulness and Perceived Ease of Use.

The target population constituted 60 teachers, 6 deans of study and 6 principals of public secondary schools in Samburu North Sub-County. This target population was sampled and selected using cluster and judgement sampling procedures. A questionnaire and an interview schedule were the research instruments used to collect data from teachers, deans of studies and school principals. The research project was guided by a descriptive survey design. The data was analysed using descriptive statistics and presented on tables, pie charts and bar graphs.

The findings were interpreted, discussed and presented on bar graphs, tables and in percentages for ease of discussions, interpretations and conclusions. A quantitative data was worked out using percentages as well as weighted mean with the help of SPSS software, IBM version 20, while a qualitative data was analysed using descriptive statistics. The study revealed that teacher factors such as training, age, experience in teaching, gender and attitude influence teachers' adoption and use of ICT in teaching and learning.

5.2.1 Training of Teachers and ICT Integration

Based on the findings, this study found that training of teachers in ICT was essential. The majority (70.5%) of the respondents agreed that pre-service and in-service training of teachers can influence teachers' readiness to ICT integration in classroom activities. The findings showed that majority (63.4%) of teachers were untrained in computer packages during pre-service teacher training programmes, against 36.6% who received training in ICT during pre-service programmes. The study also found that in-service training programmes on ICT integration have been hampered by inadequate funds. On the availability of ICT workshops, 52.2% of the total respondents agreed that teachers do not attend ICT in-service training. The ICT integration workshops had thus remained a sole responsibility of the national government basically the Ministry of Education, Science and Technology to organize and fund these workshops.

5.2.2 Age of Teachers and ICT Integration

The study established that age of teachers had considerable influence on ICT integration in teaching and learning. The age bracket of teachers mostly accessing and using computers in teaching was found to be below 30 years, rated as 61.4% of the

total respondents. According to the findings, old teachers were not attending ICT workshops and 47.7% of the respondents cited that aged teachers (41 years and above) rarely attend computer in-service training.

5.2.3 Experience of Teachers and ICT Integration

The study further found that work experience of teachers in teaching profession had some influence in adoption and use of ICT tools in preparation of lessons. The findings thus indicated that majority (59.1%) of the respondents have acquired ICT skills during pre-service teacher education programmes. The teachers with less than 10 years in teaching profession demonstrated great interest in the use of instructional technology. On the other hand, teachers with more years in teaching profession cited negligible interest in the use of technology in classroom activities. This could commonly be observed in schools where teachers who served for long period of time in teaching profession could rarely use computer for their private or professional activities.

5.2.4 Influence of Gender on ICT Usage

The study was also aimed at ascertaining the extent to which gender influences use of ICT in teaching and learning. From the findings, 26% of the respondents indicated that both male and female teachers do not access and use computers while 36% cited that neither male nor female teachers accessed and used computers in teaching and learning. The respondents gave general opinions on ways of effectively improving adoption and use of ICT by male and female teachers. The respondents cited training of all teachers on ICT integration as the most effective way of promoting use of ICT in the classroom activities. Another group of respondents in the study suggested that teachers of different genders should be given equal opportunities

in ICT and motivate them with monetary rewards and certification. The incorporation of ICT in the mainstream curriculum and creation of public awareness on significance of ICT in teaching were the common response given. Generally, the respondents cited that purchasing computers for schools can actually promote the access and use of ICT in teaching and learning.

5.2.5 Teachers' Attitude and ICT Integration

On attitude, this study found that teachers possessed positive attitude towards integration of ICT in teaching and learning. Regarding the use of computers, teachers agreed that using computers to prepare and present digital content in the classroom show a negative attitude. However, a positive attitude towards ICT in pedagogy was measured using a weighted mean above 3.0. In connection to internet access and use, the respondents mentioned smart phones as their main source of internet services although cyber café formed part of their sites to type lesson notes and examinations as well as to browse internet. Generally, the availability of quality digital content online was held in positive outlook by the respondents as a source of digital content with suitable learning experiences.

The study established some of the main inhibitive factors that inhibitive include inadequate skills in ICT integration in teaching as cited by 52.3% of the respondents. The other respondents have also viewed use of ICT tools as time consuming and cumbersome especially for teachers with inadequate skills in ICT integration. Moreover, lack of relevant experience in ICT integration was cited as a deterrent factor that discouraged teachers from using computers in teaching subject content of non-ICT subjects.

5.3 Conclusion of the Study

Based on the findings, the study found that adequate training of teachers on ICT integration determined their readiness to use instructional technologies in teaching and learning. The study established that training offers teachers hands-on skills useful for effective integration of ICT in classroom practices. On the other hand, teachers with inadequate ICT skills and competencies were unable to competently integrate Information and Communication Technology in classroom activities.

The other objective involved in the study was age of teachers' influences ICT integration in teaching and learning. The study thus found that age of teachers influences adoption and usage of instructional technologies in classroom environment. The findings indicated that teachers aged below 30 years were enthusiastic integration of technologies in classroom activities. The study however revealed that teachers aged above 40 years were unskilled and incompetent to utilize ICT tools either in private use or for teaching activities. On this objective, the study concluded that young teachers were more competent and interested in ICT integration in teaching and learning unlike old teachers who do not use ICT tools in the classroom.

In another objective, the study established that the length of work experience of a teacher in teaching service had no influence in ICT integration in teaching and learning. This was evident for the fact that teachers with less than 10 years in teaching service indicated the highest degree of self-efficacy in the use of ICT tools in classroom practices. On the contrary, the study revealed that teachers with work experience of more than 10 years in teaching profession did not have interest in technology and were unable to use ICT tools to prepare lesson notes and to present a digital content to the learners.

As an objective, the gender of teachers was investigated on the use of ICT in teaching and learning. The study concluded that male teachers were relatively accessing and using the new technologies in teaching and learning. At this point, the male teachers were reported to utilize computers and other ICT tools in teaching and learning more that female teachers.

The attitude of teachers was another objective tackled in the study. This study indicated that teachers had positive attitude towards instructional technologies as a major predictor of their intentions to adopt and use ICT to implement the curriculum. As cited in Dix (2007), Akbaba and Kuruback (1998) concluded that teachers' attitude and beliefs about technologies are directly influenced by their training. The findings of this study therefore indicated that teachers' attitude could be improved by providing teachers with new ICT integration training and providing schools with adequate ICT facilities.

5.4 Recommendations

Based on the findings and conclusion of this study, the researcher recommends that:

This study explored whether training of teachers in ICT influences ICT integration in teaching and learning. The study therefore found that majority (63.4%) of teachers was not trained in ICT while minority (36.6%) were trained with technological competency and self-efficacy to utilize the instructional technologies in classroom practices. Based on the findings, this study recommends that the Ministry of Education, Science and Technology (MOEST), in collaboration with the Ministry of Finance, should allocate adequate funds in order to provide scholarships and finance for pre-service and in-service training of teachers on ICT. The school

administration should also facilitate their teachers to attend ICT integration workshops to equip them with adequate skills in ICT integration in their subjects. The training enabled teachers to acquire fresh skills on instructional technologies.

The study also focused on the age of teachers to determine the level of adoption and usage of ICT in teaching and learning processes. According to the findings, the young teachers aged below 40 years were able to use a given application software and hardware such as LCD projectors, smart phones and digital cameras to prepare and to present lesson notes in the classroom. However, teachers aged above 40 years were unable to use instructional technologies in teaching and learning. This study therefore recommends that the Ministry of Education, Science and Technology (MOEST) should collaborate with Kenya Institute of Curriculum Development (KICD) to develop curriculum for Teacher Education Institutions such as Teachers' Training Colleges Teachers to offer ICT integration as a compulsory subject. Every student-teacher should then be given equal opportunity to acquire ICT training including Technological, Pedagogical and Content Knowledge (TPACK). This strategy can therefore improve the quantity and quality of teaching workforce with ICT skills for effective implementation of curriculum in public secondary schools in all the Counties of Kenya.

The length of teachers' work experience in teaching service was also investigated in this study. The findings established that length of work experience did not influence ICT integration in teaching and learning. The senior teachers with more years of experience above 5 years were not skilled to use computers unlike newly recruited teachers below 5 years in teaching profession who were appreciatively enthusiastic and held considerable self-efficacy in the use of technology in teaching

and learning. This study therefore recommends that the MOEST and KICD should provide all secondary school teachers with regular refresher courses (in-service training) on ICT integration, and carter for their travel allowances and provide certification for motivation purposes. These in-service trainings could be done by contracting ICT integration Trainers to conduct workshops at the national, county or school levels in order to provide teachers with hand-on skills in instructional technologies. The in-service training programmes should be conducted at the county level during the months of school vacations such as April, August and December.

The study had also investigated the extent to which gender influences use of ICT in teaching. The findings indicated that male teachers utilized ICT tools in teaching and learning more than female teachers. In practical situations, female teachers rarely use computers for their private and teaching activities. On the contrary, the female teachers consulted and sought assistance from the male teachers or from commercial cyber cafés for typing, printing and photocopying services. In order to enhance experience in usage of ICT tools among male and female teachers, this study recommends that the MOEST should provide all public secondary schools with ICT infrastructure and computing facilities which include computer laboratories with full networking and wireless fidelity (WiFi). In order to fill gender digital gap, this study recommends that the Ministry of Education, Science and Technology (MOEST) should provide scholarships, bursaries and loans to all teachers, male and female, in every financial year. This strategy enables teachers to pursue ICT related courses in pre-service training during school vacations. This strategy can encourage female teachers to acquire skills and competencies in ICT integration relevant to their daily teaching and learning activities. The availability of ICT facilities in school enables all

teachers to constantly access and use computers and other ICT tools to prepare their lessons and present to learners in the classroom.

The study investigated the influence of teachers' attitude towards ICT integration in teaching and learning. The findings revealed that teachers had positive attitude towards ICT integration in classroom activities. Based on the findings, the study concluded that despite positive attitude towards ICT, teachers did not begin to use ICT in teaching and learning. This study therefore recommends that the MOEST and the County Government should intensify training of teachers, motivation of teachers with allowances and provision of ICT infrastructure in schools in order to improve teachers' attitude towards instructional technologies. The MOEST should also award certificates to every teacher after completing a given number of course modules on ICT integration in teaching and learning.

5.5 Suggestions for Further Research

This study focused on teacher factors influencing integration of Information and Communication Technology in teaching and learning in public secondary schools in Samburu North Sub-County. In this case, the researcher was not able to deal with a wider range of issues pertaining to student factors influencing ICT integration and students' readiness to use the new technology in learning processes. The researcher therefore recommended that a future research should focus on students' factors influencing ICT integration in teaching and learning in public secondary schools in Samburu North Sub-County, Kenya.

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APPENDICES

APPENDIX I: Introduction Letter to the Respondent

University of Nairobi,
Department of Administration and Planning,
P.O. Box 30197,
NAIROBI.

26th February, 2015

Dear Respondent,

RE: Request for Filling of Questionnaires for Research Purposes

I am a post-graduate student undertaking Master of Education degree, specialising in Curriculum Studies under the University of Nairobi. I am currently carrying out a research project for the purpose of investigating *Teacher Factors Influencing Integration of Information and Communication Technology (ICT) in Teaching and Learning in Public Secondary Schools in Samburu North Sub-County, Kenya.*

I kindly ask for your support to honestly and accurately fill the questionnaire attached here-in and return to me for analysis. Please be assured that your identity will be treated with utmost confidentiality and information was used for research purpose only. For this reason, do not write your name on the questionnaire.

I look forward to your assistance and cooperation.

Thank you

Yours sincerely,

Lawrence Lentilalu

APPENDIX II: Questionnaire for Teachers and Deans of Study

SECTION A: Demographic Information

1A. Indicate your Gender: Male [   ]   Female [   ]

2A. What is your age bracket? (a) Less than 30 years [   ] (b) 31– 40 years [   ]

(c) 41–50 years [   ] (d) Over 51 years [   ]

3A. What is your highest academic qualification? (a) Diploma [   ]   (b) B.ED [   ]
(c) M.ED [   ] (d) BA/BSC with PGDE [   ] (e) OTHERS [   ] (specify):
....

4A. Indicate the type of public secondary school you teach.

    1) Baragoi Girls   [   ]

    2) Baragoi Day-Mixed school   [   ]

    3) Nyiro Girls   [   ]

    4) Nyiro Boys   [   ]

    5) Baragoi Boys   [   ]

    6) P.C.E.A. Tuum Girls   [   ]

SECTION B: The Extent to which Training of Teachers Influence ICT Integration in Teaching and Learning

1B. Are there in-service training on ICT integration available for teachers?

    a) YES [ ]   b) NO [ ]   c) NOT SURE [ ]

2B. If YES, are there teachers in your school who attended ICT workshops/training?

    a) YES [ ]   b) NO [ ]   c) NOT SURE [ ]

3B. If NO, why? ....

4B. Do you have skills/training in ICT Integration in teaching and learning?

    a) YES [ ]   b) NO [ ]   c) NOT SURE [ ]

5B. Do you believe that computer training of teachers is important in imparting and improving teacher's ICT skills?   a) YES [ ]   b) NO [ ]   c) NOT SURE [ ]

6B. If YES, how would training helps improve teacher's readiness to use ICT?

....

7B. If NO, why? ....

8B. Who finances ICT workshops/trainings in your Sub-County?

National Government Educational Support Program-ICT project   [   ]

County Government   [   ]

School   [   ]

Community   [   ]

Non-Governmental Organizations   [   ]

None of the above   [   ]

9B. Do you have enough educational resources (e.g. e-content) to integrate ICT in teaching?   a) YES [ ]   b) NO [ ]   c) NOT SURE [ ]

10B. Have all the teachers in your school attended ICT training?

            a) YES [ ]   b) NO [ ]   c) NOT SURE [ ]

11B. If NO, why haven't all teachers in your school attended ICT training?

....

12B. In your opinion, does a teacher's computer training influence teachers readiness to use ICT in secondary schools?   a) YES [ ]   b) NO [ ]   c) NOT SURE [ ]

Comment briefly:..

13B. Are there enough ICT facilities for training of teachers?

       a) YES [ ]   b) NO [ ]   c) NOT SURE [ ]

SECTION C: The Extent to which Age of Teachers Influence ICT integration in teaching and learning

1C. Tick the age bracket of teachers mostly accessing and using computers. You can select multiple choices if appropriate.

Below 30 years   [ ]   41 – 50 years   [ ]

31 – 40 years   [ ]   Over 51 years   [ ]

2C. Old teachers do not attend in-service training on ICT integration.

Strong Agree [ ]   Not sure   [ ]   Strongly disagree [ ]

Agree   [ ]   Disagree   [ ]
3C. In-service training has been attended by teachers aged:

Below 30 years   [ ]   None of the above   [ ]

31 – 40 years   [ ]

41years and above   [ ]

4C. Indicate the age of teachers with ICT training during pre-service training.

Below 30 years   [ ]   41 years and above   [ ]

31 – 40 years   [ ]   None of the above   [ ]

SECTION D: Extent to which Teachers' Experience Influence ICT Integration in Teaching-Learning

1D. For how long have you been in teaching profession?

Less than 10 years [ ]   21 – 30 years [ ]   Over 40 years [ ]

11 – 20 years [ ]   31 – 40 years [ ]
2D. When was your first time to use computers in teaching?

Less than 10 years [ ]   21 – 30 years ago [ ]   Not at all [ ]

11 – 20 years ago [ ]   Over 31 years ago [ ]
3D. When was your last time to use computers in teaching?

Less than 10 years ago [ ]   21 – 30 years ago [ ]   Not at all [ ]

11 – 20 years ago   [ ]   Over 31 years ago [ ]

4D. Do you think the teachers' age influences the ICT integration in teaching-learning?   a) YES   [   ]   b) NO [   ]   c) NOT SURE   [   ]

Briefly explain your answer...

5D. Do you have your personal computer?   a) YES [   ]   b) NO [   ]

6D. If NO, who types your notes for the lesson?

a) Own [   ]   b) Cyber Café [   ]   c) Others teachers [   ]   d) Not typing anything

7D. If helped in cyber café and by other teachers, then why?.....................................

8D. For what purpose do you mostly use your computer?

Type notes   [   ]   Watch movies [   ]

Set and type exams [   ]   Listen songs   [   ]

Other Uses (specify): ....

9D. Do you access internet?   a) Yes [   ]   b) No [   ]   c) Sometimes [   ]

10D. If YES, where? a) School [   ]   b) My Home [   ] c) Cyber Café [ ]
d) Friends [ ]   e) Others [   ] (specify)...

11D. If NO, why? ....

12D. How frequently do you browse internet?

Less than 1 hour per day   [   ]   More than 7 hours a day   [   ]

2 – 4 hours per day   [   ]   None of the above   [   ]

5 – 6 hours per day   [   ]

13D. In your opinion, what can be done to improve adoption and use of ICT in curriculum?...

SECTION E: Extent to which gender influences use of ICT in Teaching-learning

1E. Does gender influence teachers from using ICT in their lessons?

 YES [ ]   NO [ ]   NOT SURE [ ]

If NO, explain:..

2E. Do female teachers attend in-service training?

Yes [ ]   b) No [ ]   c) Not Sure [ ]

3E. If NO, explain: ....

 4E. Teachers with training Certificates in ICT are mostly:

Female [ ], Male [ ], All [ ], None [ ]   Not Sure [ ]

5E. Computers are commonly used by: Female [ ], Male [ ], All [ ], None [ ]

6E. Teachers who own computers are mostly: Female [ ], Male [ ], All [ ], None [ ]

7E. Teachers who type their notes and exams using computers are:

    Female [ ], Male [ ], All [ ], None [ ]

8E. Indicate with a tick (√) where it's TRUE and a cross (x) where NOT TRUE.

a) Loosing work easily in case of power failure   [ ]

b) One has to keep on saving work when typing   [ ]

c) It entirely depends on electricity   [ ]

d) Some information in the internet is not true   [ ]

e) Typing is hard   [ ]

9E. In your opinion, how can gender disparity in ICT integration be addressed?

....
....

SECTION F: Influence of Teachers' Attitudes to ICT Integration in Teaching and Learning

Using the scale of 1 to 7 given below, please fill in empty cells at the right end of the table. Strongly Agree [1], Agree [2], Partly Agree [3], Disagree [4] Strongly Disagree [5], Partly Disagree [6], Not Sure [7]

1F. I feel self-assured that I can design ICT based learning activities in my subject	
2F. I feel confident to use suitable a software to present concepts in my subject area	
3F. I feel confident that I can to select appropriate software to use in my lessons	
4F. I often exchange ideas about technology integration with other teachers	
5F. The principal and other teachers force me to integrate ICT in teaching and learning	
6F. There are other teachers in my school who use computers in teaching and learning	
7F. I often discuss with other teachers about ICT integration in our respective subjects	
8F. I believe that ICT helps me simplify concepts better	
9F. I am assured that Internet gives suitable content with suitable learning experiences	
10F. I like using e-mail to communicate with teachers and students	
11F. I use computers in designing and presenting content is not easy for me	
12F. I like using computers in typing exams and class assignments for students	
13F. I feel demoralized when I fail to fix small computer malfunction during lessons	
14F. I doubt the concept of using technology in non-ICT subjects	
15F. The computer is unreliable for teaching because of technical problems in a lesson	
16F. I believe that ICT will change the way I teach	
17F. I rarely answer questions based on ICT because of limited ideas.	

APPENDIX III: Interview Schedule for Deans of Study and Principals

SECTION G: Interview Schedule

The researcher will administer interview schedule to the ICT Champion, the School Principals, the Dean of Studies and the Heads of Departments.

1G. Indicate your Gender: Male [   ]   Female [   ]

2G. What is your age bracket? (a) Less than 30 years [   ] (b) 31– 40 years [   ]

(c) 41–50 years [   ] (d) Over 51 years [   ]

3G. What is your highest academic qualification? (a) Diploma [   ]   (b) B.ED [   ] (c) M.ED [   ] (d) BA/BSC with PGDE [   ]   (e) OTHERS [   ] (specify): ....

4G. Indicate the type of the public secondary school you teach and manage.

    1) Baragoi Girls   [   ]

    2) Baragoi Day-Mixed school   [   ]

    3) Nyiro Girls'   [   ]

    4) Nyiro Boys   [   ]

    5) Baragoi Boys   [   ]

    6) P.C.E.A. Tuum Girls   [   ]

5G. In your opinion do teachers like utilizing ICT in the teaching process?

…………………………...

6G. In your opinion, what would make teachers not utilize ICT in teaching when computers are available? ……………………...

7G. How can the teachers' attitude towards ICT be modified for the better so as to help them embrace the use of ICT in teaching? ....

8G. In one word, how would you summarize the attitude of teachers towards ICT use in your school?...

9G. How frequent do training of teachers take place or held?..............................

10G. Comment of teachers' attendance to in-service trainings...…

11G. Who funds training of teachers? ....……………………......

12G. What criterion is used to invite teachers to training?.…………….........................

13G. What is an estimate number of female teachers and male teachers attending the training? ....……………………………………………..

14G. What are some motivating factors that influence teachers to attend to training?

……………………...……………
…………….......................................

APPENDIX IV: Research Permit from NACOSTI

THIS IS TO CERTIFY THAT:
MR. LAWRENCE LENTILALU
of UNIVERSITY OF NAIROBI, 0-20601
BARAGOI, has been permitted to conduct
research in *Samburu County*

on the topic: *TEACHER FACTORS*
INFLUENCING INTEGRATION OF
INFORMATION AND COMMUNICATION
TECHNOLOGY IN TEACHING AND
LEARNING IN PUBLIC SECONDARY
SCHOOLS IN SAMBURU NORTH
SUB-COUNTY, KENYA

for the period ending:
15th July, 2015

Permit No : NACOSTI/P/15/9132/5804
Date Of Issue : 8th May, 2015
Fee Recieved : Ksh 1,000

Applicant's
Signature

Director General
National Commission for Science,
Technology & Innovation

85

APPENDIX V: Research Authorization Letter from NACOSTI

NATIONAL COMMISSION FOR SCIENCE,
TECHNOLOGY AND INNOVATION

Telephone: +254-20-2213471,
2241349, 310571, 2219420
Fax: +254-20-318245, 318249
Email: secretary@nacosti.go.ke
Website: www.nacosti.go.ke
When replying please quote

9th Floor, Utalii House
Uhuru Highway
P.O. Box 30623-00100
NAIROBI-KENYA

Ref: No.

Date:

8th May, 2015

NACOSTI/P/15/9132/5804

Lawrence Lentilalu
University of Nairobi
P.O. Box 30197-00100
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on *"Teacher factors influencing integration of Information and Communication Technology in teaching and learning in public secondary schools in Samburu North Sub-County, Kenya"* I am pleased to inform you that you have been authorized to undertake research in **Samburu County** for a period ending **15th July, 2015.**

You are advised to report to **the County Commissioner and the County Director of Education, Samburu County** before embarking on the research project.

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

DR. S. K. LANGAT, OGW
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner
Samburu County.

The County Director of Education
Samburu County.

Appendix VI: County Commissioner's Research Authorization Letter

MINISTRY OF INTERIOR AND CO-ORDINATION OF NATIONAL GOVERNMENT

Telegraphic Address
Telephone. (065) 62002
FAX: (065)email :samburucountycommissioner@gmail.com
When replying please quote

OFFICE OF THE COUNTY COMMISSIONER
SAMBURU COUNTY
P.O. BOX 2 - 20600
MARALAL

19th June, 2015

OP/SBU/ED/C/12/16/VOL.1/6

TO WHOM IT MAY CONCERN.

RE: RESEARCH AUTHORIZATION
LAWRENCE LENTILALU- STUDENT: UNIVERSITY OF NAIROBI

I refer to a copy of a letter Ref: NACOSTI/P/15/9132/5804 copied to this office, dated 8th May 2015.

The above named is a student at University of Nairobi and is undertaking a Masters of Education degree in Educational Administration and Planning of the University of Nairobi. As part of training he is expected to carry out his study in Samburu North Sub-County.

Please accord him the necessary support in this endeavor.

NKANATHA J.M.
COUNTY COMMISSIONER
SAMBURU COUNTY.

Appendix VII: County Commissioner's Research Authorization Letter

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY
STATE DEPARTMENT OF EDUCATION

Telegram: "EDUCATION", Samburu
Fax No: 06562413
E-mail: cdesamburu@gmail.com
When replying please quote

COUNTY DIRECTOR OF EDUCATION
SAMBURU COUNTY
P.O. BOX 327 - 20600
MARALAL

CDE/SBU/C/EXT/1/VOL 1/11

19TH JUNE, 2015

TO WHOM IT MAY CONCERN

RE: RESEARCH AUTHORIZATION
    LAWRENCE LENTILALU – STUDENT: UNIVERSITY OF NAIROBI

Reference is made vide your letter Ref: NACOSTI/P/15/9132/5804 copied to this office, dated 8th May, 2015.

The above named is a student at University of Nairobi and is undertaking a Masters of Education Degree in Educational Administration and Planning at Nairobi University.

As part of training, he is expected to carry-out his study in Samburu North Sub-County.

Please accord him the necessary assistance.

COUNTY DIRECTOR OF
EDUCATION
SAMBURU COUNTY
P.O. BOX 327-20600
MARALAL

MITHAMO J. M.
FOR: COUNTY DIRECTOR OF EDUCATION
SAMBURU COUNTY