INFLUENCE OF INTEGRATION OF INFORMATION COMMUNICATION TECHNOLOGY ON TEACHING AND LEARNING GEOGRAPHY IN PUBLIC SECONDARY SCHOOLS IN MWALA SUB-COUNTY, KENYA

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DECLARATION

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

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This research project has been submitted with my approval as the university supervisor

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DEDICATION

This project is dedicated to my family; my wife Franciscah Muno, My children Erick and Francis, my Mum Elizabeth Mwelu and my brother Dr. Raymond Musyoka for their unlimited support during my studies. May God bless you all.

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ABBREVIATIONS AND ACRONYMS

ACE   Accelerating Century Education

AIDS   Acquired Immune Deficiency Syndrome

DESD   Decade of Education for Sustainable Development

EFA   Education for All

IRI   Interactive Radio Instructions

ISTE   International Society for Technology in Education

IT   Information Technology

KESSP   Kenya Education Sector Support Programme

KIE   Kenya Institute of Education

LDCs   Less Developed Countries

MDGs   Millennium Development Goals

MHEST   Ministry of Higher Education, Science and Technology

MOE   Ministry of Education

MOEST   Ministry of Education, Science and Technology

STIC   School Technology Innovation Center

TSC   Teachers Service Commission

UNLD   United Nations Literacy Decade (UNLD)

UN   United Nations

UNESCO   United Nations Education, Scientific and Cultural Organization

USA   United States of America

USAID   United States Agency for International Development

SPSS   Statistical Package for Social Sciences

ABSTRACT

We are living in the digital age and hardly any aspect of human endeavour can be effectively carried on without Information communication technologies (ICTs) including education. ICTs are now at the center of education reform in line with the technological development of the 21st century. ICT-supported education can promote the acquisition of the knowledge and skills that will empower students for lifelong learning. Although schools have had computers for almost two decades, ways to use them effectively have evolved slowly and patchily. Technological revolution in schools has been beset by theoretical inadequacies that have kept educational technology at the margins of the established educational system. This creates a digital divide between the developed countries and the developing countries in relation to integration of ICTs in teaching and learning geography. The study was done in secondary schools in Mwala Sub-County; to assess the ICT facilities and infrastructure; to determine the teacher's ICT knowledge and skills in application of ICT; to establish how the schools get the ICT technical support in and to establish the school administrative practice that influences the use of ICT in teaching and learning geography in secondary schools. Non-experimental descriptive survey design was used to establish the factors that influence the integration and the use of ICTs in teaching and learning geography in secondary schools in Mwala Sub- County. There are 75 secondary schools that made up the target population. A sample of twelve schools which-30% of the total population was used in the study. Stratified random was used to allow full participation of the schools. There are 463 teachers in secondary schools that make up the target population. Four teachers were randomly sampled in each sample school to fill the questionnaire and twenty three principals were interviewed to represent each category of schools. Questionnaires, observation schedule and interview enabled the researcher collect data. Piloting was done in two schools to test the reliability and validity of the research instruments. The data collected was analyzed using statistical package for social sciences (SPSS). Descriptive statistics was used to present the results of the study and the general trends; this involved tabulating, graphing and describing data. This was followed by a discussion of the finding, drawing conclusions and giving recommendations based on the finding in the study. The study finding revealed that inadequate ICT infrastructure, limited ICT skills and training, limited access to technical support, lack of ICT policies in school and budget constraints hinder the integration of ICT in teaching and learning geography in secondary schools. The researcher recommends that the school administration familiarize themselves with the national ICT policy so that they can develop school ICT policies of how to efficiently integrate ICTs in teaching and learning geography. The government should also intensify ICT funding in schools to help subsidize the high ICT costs and increase the number of computers in schools. Teacher training programmes should factor in ICT units to enhance ICT skills in teaching and learning geography.

<div align="center">**CHAPTER ONE**</div>

<div align="center">**INTRODUCTION**</div>

1.1 Background of the study

Many governments in Africa have tried to put emphasis in education especially since independence. This has seen many government increase budget allocation in education (UNESCO, 2000). The move is motivated by the fact that education is the cornerstone of economic growth and development. Education helps to mitigate poverty and its effects by developing human capital consequently increasing the level of social and private benefits.

Apart from expanding allocation to education, governments have been reforming their education system especially in the less developed countries (LDCs). Education reform efforts in less industrialized countries have aimed at making education an effective vehicle for national development (Abagi and Odipo, 1997). ICT is now at the center of education reform efforts that involve its use in coordination with changes in curriculum, teacher training, pedagogy, and assessment (Kozma, 2000). ICT is an effective tool that if integrated successfully forms a key pillar of education training (Tomar and Kumari, 2005).

The integration of IT into virtually all aspects of the economy and society is creating a digitally-enabled economy that is responsible for generating economic growth and prosperity (Bollou, 2006). Maguire (2003) further notes that the ICT sector has the potential to generate economic development and create pathways into the Knowledge Economy. The adoption of ICT into the practice of education is not something that began with the emergence of the new digital technologies;

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technologies such as radio, telephone and television have been and are still being used at present; what is new are the many ways that they can be combined and mixed with the new technologies which mainly consider use of computers (Farrell, 2007).

There is a growing interest in using computers at the secondary level to improve instruction which involves a variety of applications, mainly utilizing Internet access (Murphy, Anzalone, Bosch and Moulton, 2007) and create the opportunity to exchange ideas, consult experts, take students on virtual field trips, and access online libraries (Wartkins, 2009). According to Spence and Smith (2009) ICT-enabled communications build human capabilities and freedoms and also offer students the opportunity to learn how to use electronic tools to access information and develop research skills in solving problems. United Nations and the World Bank reported that ICT can increase access to education network for students, train teachers and, broaden availability of quality education material for emerging global economies (World Bank 2003).

Many schools are restructuring to accommodate ICTs as it is of great help in providing multimedia information and allow access to a broader range of instructional resources. Most teachers see ICT as an important tool for motivating students, providing excellent tools for supporting teaching and also help learning. The schools also acknowledge that administrative functions have been enhanced by the computers (Oloo, 2009). ICT spending is mostly on hardware, software, infrastructure and training. ICT integration in schools therefore requires investment in equipment, professional development and teacher training, technical

support, connectivity and digital learning process. Investments in custom-made digital materials with highly relevant content for Kenyan classrooms in rural and urban contexts are important in order to tap into potential of ICTs for teaching and learning geography.

1.2 Statement of problem

Computers are spreading rapidly in schools not just in wealthy countries, but increasingly in developing ones as well. However, although schools have had computers for almost two decades, ways to use them effectively have evolved slowly and patchily. Technological revolution in schools has been beset by theoretical inadequacies that have kept educational technology at the margins of the established educational system. Research findings across the country have revealed that there are ICT facilities in the secondary schools such as computers, computer laboratories, internet connections, alongside the traditional methods of telecommunication. Further research has revealed that teachers do not make real use of ICTs at their disposal hence weak integration and usage in classroom activities-teaching and learning geography. In addition, most secondary schools in Kenya are in the rural areas and they face a number of challenges including; high levels of poverty, limited rural electrification and frequent power disruptions, inadequate connectivity and network infrastructure. This creates a digital divide between the rural and the urban schools as well as the developed and the developing countries.

Failure to take full advantage of the opportunities offered by technological advances to education for massive expansion represent a drastic lag in skilled innovative manpower narrowing the possibilities for individual activities in areas

of business, research, learning, health and welfare and many other aspects of daily (MHEST and NCST, 2010). The study sought to address and establish the factors that affect the integration and use of ICTs in secondary schools in Mwala Sub-County.

1.3 Purpose of the study

The purpose of the study was to establish the factors that influence and affect the efficient use of ICT in teaching and learning geography in secondary schools in Mwala Sub-County.

1.4 Objectives of the study

(i) To assess the ICT infrastructural capacity for teaching and learning geography in secondary schools in Mwala Sub-County.

(ii) To determine the level of teacher's ICT knowledge and skills in application of ICT in teaching and learning geography in secondary schools in Mwala Sub-County.

(iii) To establish the ICT technical support in teaching and learning geography in secondary schools in Mwala Sub-County.

(iv) To establish the school administrative practices that supports the use of ICT in teaching and learning geography in secondary schools in Mwala Sub-County.

1.5 Research questions

i. How is the ICT infrastructure for teaching and learning geography in secondary schools in Mwala Sub-County?

ii.   In what ways do the level of teachers' ICT knowledge and skills influence the application of ICT in teaching and learning geography in secondary schools in Mwala Sub-County?

iii.   What is the ICT technical support in teaching and learning geography in secondary schools in Mwala Sub-County?

iv.   What are the school administrative practice that supports the use of ICT in teaching and learning geography in secondary schools in Mwala Sub-County?

1.6 Significance of the study

The findings of the study would help the stakeholders in education to understand the factors that affect the use of ICT in the education system and make relevant decisions. The Ministry of Education (MoE) would use the findings to formulate the appropriate ICT policies in line with the National ICT Policy (2006). The school administration would use the findings in making decisions on the type of ICT infrastructure to acquire as well as the technical support necessary. The curriculum developers would find the result of the study important in developing ICT curriculum that would maximize the potential of ICT in education.

The teachers would understand how technology affect their instructional materials in class and may find it necessary to adopt the available ICT in their schools. The teacher training colleges would find the results crucial in developing educator courses to enhance pre-service ICT training on better application of ICT in classrooms. The community would understand their role in education and be more supportive in the development of ICT infrastructure in the schools especially in the rural areas.

1.7 Limitation of the study

The study was limited by time and financial constraints. The data collected was collected from randomly selected secondary schools in Mwala Sub-County. The schools in the sub-County have numerous similarities making the sample almost homogenous. The findings of the study may not reflect a true picture of the whole country and difficult to generalize.

1.8 Delimitation of the study

The study delimited itself by concentrating on the application of ICT in secondary schools. This is because ICT has different applications at different levels of education as well as wide range of use in virtually all aspects of life. The study was also grounded on a well researched literature review. Data was collected from randomly selected secondary schools in Mwala Sub-County. The study focused on teachers and how they make use ICT in teaching and learning geography.

1.9 Assumptions of the study

The researcher made the following basic assumptions with regard to this study:

i. Respondents from the representative schools were willing to provide responses, to all items on research instruments honestly and to the best of their knowledge.

ii. The participants' gender did not affect their way of responding to items in the research instruments.

iii. The sample size was sufficient to provide information with regard to teacher absenteeism and that there are existing records to monitor teacher presence.

1.10 Definition of terms

Application of ICT: use of ICT to enhance instruction and create rich environment to help each individual student develop a depth of understanding and critical thinking.

Digital age: a period in the last quarter of the 20th century when information becomes easily accessible through publications and through the manipulation of information by computers and computer networks.

Digital divide: refers to inequality of access to ICT services such as telephone, computer and internet.

ICT infrastructure: physical equipment/hardware and software that enables a network to function

Information communications technologies: includes technologies both traditional (for example radio, television, print, video) and newer technologies for example (internet virtual reality, distance education, mobile phones etc) that are intended to fulfill information processing and communication.

Innovation is an idea, practice, or object that is perceived as new by an individual.

Knowledge divide: refers to the inequality in the capability and skills to generate and use knowledge.

Pedagogy: is commonly defined as the science and art of education. It refers to the actual teaching skills a teacher uses to impart content knowledge related to a specific subject.

Technical support: basic skills to overcome technical problems when ICT are applied. It can be provided by in-school staff or external service provider.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Investment in education is critical to narrowing the knowledge gap and is fundamental to the development of the capacity for integrating knowledge into social and economic activities and for participating in today's digital economy. The education programs of the UN and UNESCO address these diverse purposes and goals; the Millennium Development Goals (MDG), Education for All (EFA), the UN Literacy Decade (UNLD), and the Decade of Education for Sustainable Development (DESD) which aim at reducing poverty and improve the quality of life. We are living in the digital age and hardly any aspect of human endeavour can be effectively carried on without ICTs (UNESCO 2008).

In the past two decades, many economies have endevoured to invest in ICTs to build knowledge driven economies by coming up with ICT national policies and ICT guidelines in their education systems. The infusion of technology in education has been seen as a means to enhance and extend not only the instructional methods, but also the learning process in this 21st century (Tin, 2002). UNESCO report (2008) reveals that ICTs are engines for growth and tools for empowerment and they have profound implications for education change and improvement.

2.2 Benefits of ICT

Use of ICTs enhances all forms of information exchange, observation, learning and decision-making. Business transactions are expanded and speeded up with ICTs and business opportunities easily identified and markets operate more

efficiently (Labelle 2005). ICTs promote access to information for private and professional decision-making which expand the range of choices and opportunities by facilitating greater access to economic, educational and development-related information. They create more awareness of factors affecting individual well-being and greater ability to influence and participate in decision-making.

ICTs also facilitate reduction of geography and distance as a factor in social and economic participation: research is much easier with ICTs, especially through the Internet. There is greater ability to learn: distance learning permits students to get accreditations online from recognized universities. ICTs empower individuals, businesses, local and community groups, and women and marginalized or disenfranchised people or groups to do what they do, only better. With ICTs and the capacity to use ICTs, these groups can access the same information that government and large corporations use.

Access to information can help level the playing field by increasing participation in economic and human development activities and in those applications that depend on information, such as markets. ICTs create greater environmental awareness: information about the weather and the environment is more readily available. It can help to predict and prepare for environmental perturbations, catastrophes, predict crop failure and prepare for emergency food relief. ICTs enhance and facilitate trade and make markets more efficient. Commerce is enabled and extended. They speed up and ease transactions of all types, and are especially important for business and government transactions. With ICTs, all

markets have the potential of being international or of being selective, depending on their requirements.

Given the many benefits of ICTs, policies should aim to strengthen the competitive and comparative advantage of hardware and ICT service providers locally, regionally and internationally.

2.3 ICT in the world

Contemporary discourses on development consistently identify ICT as a requirement for economic growth and the improvement of social conditions (Korpela 2003). The link between ICT and development has been articulated in the alarming terms of the 'digital divide' and the widening of the gap between 'developed' and 'developing' countries. There is concern that developing countries are deprived of the opportunities for economic growth and life improvement generally enjoyed by advanced economies because of the scarcity of ICT, particularly limited Internet connectivity. Capacity of a country's information and communication technology capability can potentially bring about development (Kamal & Qureshi, 2009). Countries like Singapore and Malaysia were more like Kenya at the time of independence; they have recorded a remarkable economic development because of the heavy investment in ICT.

Other developed countries have heavy investment in ICT which many researcher feel that it has been a contributing factor to the development by minimizing the gap between the rich and the poor Spence and Smith (2009), Langamia (2005), Harris (2004), Kozma (2005). Kozma 2005, further notes that knowledge creation, technological innovativeness, organizational networking, and knowledge sharing can support both sustained economic growth and social development.

Labelle (2005), articulates that Asian national leaders hold the conviction that electronics, information and communication technologies are key to the future competitiveness of their domestic economies, of their peoples' standards of living, and of their countries' abilities to fully participate in the global economy. Singapore is a world-class leader in science and technology and she is building a multi-technology, ultramodern telecommunications and information infrastructure.

Malaysia is committed to the use of ICTs to achieve its development objectives and to transform Malaysia successively to an information society, a knowledge society and finally a values-based knowledge society. According to UNDP HDR (2001), most developing countries [that] are dynamic in the use of new technology can be defined as dynamic adopters which include are Brazil, China, India, Indonesia, South Africa and Tunisia, among others. Many of these countries have important high-technology industries and technology hubs, but the diffusion of old inventions is slow, uneven and incomplete to all levels of society, including rural dwellers and the poor. The Philippines and Sri Lanka also fall in this category.

China's commitment to e-enable the country is supported at the highest levels and represents a significant national investment in technology and other capabilities. A clear objective is to make China a major participant in the global economy. China's efforts to connect all major centres with fibre-optic cabling is another clear example of the enthusiasm with which ICTs are being rolled out in countries. Other developed countries have expansive ICTs in all aspects of their

daily activities (Samad 2009). Kriz and Quresh(2009) in their research they concluded that there is close link between ICTs and economic growth and development.

2.3 ICT in African countries

There has seen increasing debate about information and communication technology (ICT) as an engine of growth that could lift developing nations. Kamal and Qureshi (2009) provides insights for the ways in which information technology (IT) can be used as a tool for economic development and can help in the achievement of the Millennium Development Goals (MDGs).

There is a lot of literature on the use of ICTs in Africa, which reports on the rapid growth of ICT use, especially in urban areas. African governments have liberalized their information and communication technologies (ICT) sectors and invested huge portions of their annual budgets in ICT (Bollou & Ngwenyama, 2002) amid other necessities like hunger and combating of diseases. There are Challenges that confront sub-Saharan Africa as a whole which pose challenges in striking a balance between technology and the need for local development.

Slow connectivity in Africa is characterized by; scarce resources-absence of access or the lack of ICT, the lack of integration of the local languages into the system, varying and updating the contents of materials that are posted on the websites (Kamel and Weigler, 2001). Many rural areas do not yet form part of the national electricity grid" (Conradie et al., 2003, p.31) this is particularly an acute problem since technology and the Internet can only be very effective if it is generated by electricity.

Africa is facing today the uneven access to and skills in information and communication technology (ICT) which results to digital divide with the developed countries. This has resulted to over dependence on the developed western countries. Zheng (2009) notes that Western values and advice have been often imported without deep reflection and consideration of their compatibility with local conditions. Conradie et al (2003) argue that since technology is coming from outside, sometimes it does not address the local problems.

Majority of poor countries, Africa included are lagging behind in the information revolution. Not surprisingly, the quest for connectivity has been problematic and will require fundamental shifts in the regulatory environment, as well as renewed attention to public-private partnerships and social services. Developed countries have 80 per cent of the world's Internet users (UNHD 2001).

Table 2.1: Number of Internet users, 1999 and 2002

Region	Number of Users (million)	
	1999	**2002**
Africa	3.11	4.15
Asia/Pacific	104.88	157.49
Europe	113.14	171.35
Middle East	2.40	4.65
Canada & USA	167.12	181.23
Latin America	16.45	25.33
World Total	407.10	544.20

Source: UNHD 2001

Jensen (2002) observes that prohibitive cost and sparse and unreliable telecommunication networks form the major hindrance for many people in Africa to use ICTs. Findings show that the greatest number of Internet users in Africa resides in either South Africa or Kenya in the sub Saharan region or in Morocco and Egypt in the northern region.

South Africa has a well developed Internet infrastructure in business and academia, and its degree of connectivity places it in the top 25 in the world. (Langmia 2005)

Table 2.2: Internet access and usage (RIA 2007/2008)

Country	Households with working internet connection	Citizen 16 years and below using internet
South Africa	4.8%	15.0%
Namibia	3.3%	8.8%
Kenya	2.2%	15.0%
Cameroon	1.2%	13.7%
Mozambique	0.9%	1.0%
Ghana	0.5%	6.7%
Botswana	0.1%	5.8%
Ethiopia	0.1%	0.7%
Uganda	0.0%	2.4%
Burkina Faso	0.0%	4.3%

Source: www.allafrica.com

2.4 ICT integration in education

There has been a high level of investment in information and communications technology (ICT) in education over a prolonged period of time throughout the 'developed world' (Twining 2002). Interest in ICT in education in England stretches back to at least the mid-1960s, when the original National Council for Educational Technology was first formed (CET 1975). At this time the main focus was often on further and higher education rather than on schools. Later there was expansion to the schools starting with secondary then primary schools through government funding. Twining (2002) outlines some of the policies employed by government in England in order to meet the government targets for ICT in education. Funding was made available for; The National Grid for Learning (NGfL), connecting every school in the country to the Internet; providing additional computer equipment for every school; training every teacher in state schools in the United Kingdom (UK) to make effective use of ICT as a tool to support teaching: cutting bureaucracy in schools through the use of ICT and setting up of a number of Centres of Excellence for IT and High Technology training and Skills Challenge projects.

United States of America (USA) also has a long history about technological innovation revolutionizing education in the US since the mid-1800s, starting with the introduction of text books and moving through technologies such as film, radio, television and computers (Kent and McNergney 1999). The use of computers in school level education in the US started in the sixties (Hasselbring 1986 p25). The first national educational technology plan, Getting America's Students Ready for the 21st Century: Meeting the Technology Literacy

Challenge, was developed including four key goals for educational technology: giving all teachers in the nation the training and support they needed to help students learn using computers; all teachers and students were to have modern multimedia computers in their classrooms; every classroom to be connected to the information superhighway and making effective software and on-line learning resources an integral part of every school's curriculum.

Advanced countries with integrated ICT in the education system also include; Australia, South Korea, Demark, Finland, Belgium Sweden, Singapore among others. Some typical characteristics of these countries are as follows: almost all classrooms are equipped with computers and other ICT tools; the student/computer ratio is high; Internet access is available in all schools; curriculum revision ensures nationwide ICT integration; delivery of education is increasingly online (UNESCO 2004).

Integration of ICT in schools in developing countries especially in Africa, is slow and uneven as indicated by the table below which provides some estimates of numbers of the schools reached with computers in a sample selection of African countries through NEPAD e- schools project (Farrel and Shafika, 2007).

Table 2.3: Computer Penetration Ratios at Schools African Countries

Country	Number of Schools	Schools with Computers	% of Schools with Computers
Egypt	26,000	26,000	100%
Ghana	32,000	800	2.5%
Mozambique	7,000	80	1.1%
Namibia	1,519	350	22.1%
South Africa	25,582	6,651	22.6%

Source: NEPAD e- schools project

Many governments have realized the positive impact of ICT in education henceforth developed national ICT policies and ICT education strategies to guide on its integration for maximum benefits (Bryderup & Kowalski 2002, Brunemann et al. 2000, Gulbahar & Guven 2008). According to Balanskat (2006), various countries have ICT projects for instance Denmark project ran from 2001 to 2004 with the aim to strengthen the pedagogical use of ICT.

ICTs are a potentially powerful tool for extending educational opportunities, both formal and non-formal, to the underserved for reasons of cost or because of time constraints are unable to enroll on campus. Using ICTs in the classroom has been to better prepare the current generation of students for a workplace where ICTs, particularly computers, the Internet and related technologies, are becoming more and more ubiquitous.

Technological literacy, or the ability to use ICTs effectively and efficiently, is thus seen as representing a competitive edge in an increasingly globalizing job market. ICTs can enhance the quality of education by increasing learner motivation and engagement, by facilitating the acquisition of basic skills, and by enhancing teacher training to empower students for lifelong learning. ICTs enable new ways of teaching and learning geography which constitute a shift from a teacher-centered pedagogy to one that is learner-centered.

This literature proves that there is a big technological gap between the developed countries and African countries which represent a digital divide. African governments should work quickly to bridge digital divide so that the African

states can be up to date technologically. Literature also reveals that comprehensive use of ICTs in education is dependent on;

2.4.1 ICT infrastructure and curriculum

Schools have to be equipped with the necessary ICT infrastructure in order to provide the next generations with the needed tools and resources for access and use and to attain the expected skills (Gulbahar & Guven 2008). Schools are equipped with different kinds of technological infrastructure and electronic resources available; hardware, software and network infrastructure must be available to integrate ICT in education (Afshari 2009). He further argues that limited access to computers is a barrier to effectively using computers in classes. Mumtaz (2000) states that many scholars proposed that the lack of funds to obtain the necessary hardware and software is one of the reasons teachers do not use technology in their classes.

Efficient and effective use of technology depends on the availability of hardware and software and the equity of access to resources by teachers, students an administrative staff. Use of ICT in teaching and learning geography must be accompanied by a corresponding change in curriculum. Tin (2002) explains that proper integration of ICT may require substantial pedagogical component in the IT curriculum of any teacher education program. He cautions that teaching ICT as an isolated discipline is not an effective way to encourage the use of ICT in learning. Clearly, the curriculum must be adapted or re-designed so that it is ready for ICT integration.

This shows a big gap between the traditional teaching methods and use of print content and the modern methods using the ICTs and soft copies of curriculum

materials. There is a need to develop original educational content, adapt existing content, and convert print-based content to digital media. This is not only technical but also time consuming for the teachers.

2.4.2 ICT knowledge, skills and technical support

Teacher professional development is a crucial component of the educational improvement (Tin 2002). Thus the teacher pre-service and in-service training in ICT is a must for proper integration of ICT in the education system in any country. Teachers need to be prepared to empower students with the advantages technology can bring. More to this the teacher is responsible for establishing the classroom environment and preparing the learning opportunities that facilitate students' use of technology to learn, and communicate (UNESCO 2008). Research finding have revealed that most teacher training courses focused on basic computer operations rather than advanced computer skills and subject-specific pedagogical applications (Tin 2002).

Use of new technologies requires new teacher roles, new pedagogies, and new approaches to teaching and learning geography. Before teachers have developed the ability to achieve all of the above, they must have a comfortable level of ICT skills. Unless teachers are functioning at a comfortable level of ICT skills and knowledge, they will be unable to use ICT as a primary tool for teaching and learning geography across the curriculum. Teachers need to be competent and confident users of hardware and software, to understand how to organize the classroom to structure learning tasks so that IT resources become a necessary and integral part of learning rather than an add-on technical aid" (*ibid*.). Teaching becomes a process to initiate, facilitate, and sustain students' self-learning and

self-actualization; therefore, teachers should play a role as a facilitator who supports students' learning.

The focus of teaching is to arouse students' curiosity and motivation to think, act, and learn. The change from the traditional chalk-n-talk pedagogy to new modes of pedagogy within secondary schools might introduce much uncertainty which tend to induce teachers' anxiety and cause them to feel frustrated in work. Hence many teachers have been found to offer stiff resistance to change involving technology intervention, technology integration and technology incorporation (Albirini 2007). Preparing students for real life in our technological and diverse world requires that teachers embed ICT in significant learning experiences (Braun & Kraft 1995). Research findings indicate that the use of ICTs alone does not change traditional teaching practices and that ICTs need to be supported by innovative pedagogic techniques to enhance students' self-learning and active interaction.

To reduce the anxieties associated to the use of new technologies by the teachers, there has to be a reliable professional support. The technical experts should be employed to do things the teachers might struggle to do. There is a serious need for technical support staff with high level expertise in the maintenance aspects of ICTs. Because of poor maintenance and insufficient skills to diagnose system problems and swap parts, there are many out-of-commission machines which could easily be re-activated and used. The problem of technical expertise is two faceted. In the first place, there are not enough people qualifying or attaining ICT specialist skills at the speed at which the technologies are adopted. Secondly, the problem of brain-drain whereby the few experts opt for better paying jobs

overseas (Minishi-Mananji 2007). Having technical staff available also allow them to provide assistance to students in using software applications, when they are not engaged in servicing the technology.

Whether provided by in-school staff or external service providers, or both, technical support specialists are essential to the continued viability of ICT use in a given school. Without on-site technical support, much time and money may be lost due to technical break downs. In the Philippines, for example, one of the major obstacles to optimizing computer use in high schools has been the lack of timely technical support. In some extreme cases involving schools in remote areas, disabled computers take months to be repaired since no technician is available in the immediate vicinity and so the computers have to be sent to the nearest city hundreds of kilometers away.

The gap exists where access of ICT technical support is limited because of inadequate technical training and fast evolution of ICTs which require regular in-service technical training.

2.4.3 School administration

For successful integration of ICT in teaching and learning geography there has to be proper planning at the school level. This is because the school is expected to provide the necessary ICT resources for the teachers and the students to use. An ICT integration plan provides a detailed blueprint of the steps and methods needed to translate the school ICT vision into reality (Afshari 2009). A plan is a guide to action not a substitute for it; the existence of a written ICT plan and strategy does not guarantee the comprehensive use of ICT in schools, nor does the

absence of an ICT plan necessarily equate to the lack of ICT integration in a given school (Bryderup and Kowalski 2002).

2.5 ICT in Kenya

Like many other countries in the world, Kenya has developed National ICT Policy (2006). It sets out the nation's aims, principles and strategies for the delivery of Information and Communications Technology to improve the livelihoods of Kenyans. Ministry of Education (MoE) introduced the National ICT Strategy for Education and Training (Farrell 2007).The ICT policy gives an opportunity for establishment grass root based infrastructure for knowledge sharing (Mureithi & Munyua, 2006).

The ICTs in Education Options Paper (MOEST 2005), discusses the ways in which information and communications technologies (ICTs) can be leveraged to support and improve the delivery of quality education for all Kenyans. It provides a comprehensive range of potential technologies to improve teaching, learning, and management. It is intended to enable the government of Kenya (GOK) to plan appropriate ICTs in education interventions as they move forward with the comprehensive Kenya Education Sector Support Programme (KESSP). This includes interactive radio instructions (IRI), use of computers in schools, development of ICT skills and the access of internet.

There is rich literature on ICT initiatives in Kenya both by GOK and non-governmental organizations (NGOs). GOK and the U.S. Agency for International Development (USAID) have a joint commitment to improve education in Kenya in collaboration with Kenya's Ministry of Education. This is aimed at Accelerating 21st Century Education (ACE) by improving the quality of primary

and secondary education through the effective use of information and communications technology (ICT). The initiative to establish a School Technology Innovation Center (STIC) in Nairobi will serve as a hub where education leaders and teachers access the latest information on technology solutions that are proven to enhance innovative teaching and learning geography, thus improving the skills needed by students to thrive in the 21st-century.

Kenya has government ICT Board whose main objective is to avail quality and affordable technical support to the Digital Villages to enable their smooth operation. The board has technical support focus points of standardized method for the testing and implementation of new software, the upgrading of hardware and the overall tracking of licenses and equipment. It also develops a collaborative relationship with the person responsible for Technical support and encourage them to include capacity building in the planning of future changes. The board works closely with the education institutions to ensure quality technical services as well as the internet providers.

From research, the attempt to integrate ICT in Kenyan secondary schools is faced by various challenges such as Lack of adequate number of computers in the schools, inability to acquire sufficient computers or update those which are obsolete is due to lack of finances, fast changing technology and high overhead costs, loaded curriculum which make it difficult to find time to prepare ICT teaching materials, Lack of a unified school curriculum in primary and secondary schools, resistance by teachers to use ICT in teaching and learning geography, the lack of government employed teachers the schools are forced to hire thus draining

the scarce resources which could have been used for upgrading the ICT facilities (Kidombo 2009, Oloo 2009, Farrel 2007). This is backed by the government report on ICT capabilities in secondary schools in Kenya (MHEST and NCST 2010).

2.5 Summary of the literature review

The literature has revealed that the developed countries have made remarkable investment ICT as well as integrating ICTs in their education system characterized by well formulated ICT national policies and specific strategies of ICT in education. On the other hand the developing countries Kenya included are rapidly and heavily investing in ICTs despite the other challenges they face for instance drought and famine. Despite these efforts, the countries still have low internet connectivity, inadequate power supply especially in the rural areas where most schools are located coupled with regular interruptions, low number of computers in schools. This creates a digital divide between the developed and the developing countries and thus the developing countries miss out on the benefits of ICT in almost all aspects including education which is the cornerstone of the economy and an avenue to break the poverty cycles on the developing countries. The study was done to assess the factors that affect the effective integration of ICTs in teaching and learning geography in secondary schools specifically in Mwala Sub-County.

2.6 Theoretical framework.

The study was based on Roger's theory of Diffusion of Innovations. The theory that seeks to explain how, why, and at what rate new ideas and technology spread through cultures. The original diffusion research was done as early as 1903 by the

French sociologist Gabriel Tarde. Diffusion research centers on the conditions which increase or decrease the likelihood that a new idea, product, or practice is adopted by members of a given culture or a social system.

This was extended by Rogers (2003) hence at present is commonly known as Roger's theory of diffusion of innovation. Innovation diffusion research has attempted to explain the variables that influence how and why users adopt a new information medium, such as the Internet. The diffusion of information technology and telecommunications hardware, software, and services turns out to be a powerful driver of growth, having an impact on worker productivity (Bollou, 2002). Robinson 2009 observes that, instead of focusing on persuading individuals to change, the theory sees change as being primarily about the evolution or "reinvention" of products and behaviours so they become better fits for the needs of individuals and groups.

This theory has four elements: (i) Innovation-is an idea, practice, or object that is perceived as new by an individual. (ii) A communication channel- is the means by which messages get from one individual to another. (iii)Time- is the length of time required to pass through the innovation-decision process. Rate of adoption is the relative speed with which an innovation is adopted by members of a social system. (iv) Social system- is defined as a set of interrelated units that are engaged in joint problem solving to accomplish a common goal.

Each member of the social system faces his/her own innovation-decision that follows a 5-step process; Knowledge – person becomes aware of an innovation and has some idea of how it functions, Persuasion – person forms a favorable or

unfavorable attitude toward the innovation, Decision – person engages in activities that lead to a choice to adopt or reject the innovation, Implementation – person puts an innovation into use, Confirmation – person evaluates the results of an innovation-decision already made (Orr2003, Sahin 2006). This compels the user to continue adoption or later reject the technology.

The adoption or rejection of innovations is characterized by; the relative advantage, compatibility, simplicity, trial-ability and observability. So the understanding and utilizing diffusion networks can aid strategy aimed at quickly inducing system-wide change (Orr 2003, Robinson 2009, Sahin 2006).

Given that the education stakeholders are aware of the ICT innovations across the world, the rate of adoption is still very low and especially in the developing states. Rogers' diffusion of innovations theory is the most appropriate for investigating the adoption of technology in higher education and educational environments (Medlin 2001; Parisot 1995). The study addressed the factors that affect the use of ICTs in education given the relative advantage.

2.7 conceptual framework

The study focused on the interaction between the variables that influence the integration of ICT in secondary schools in Mwala Sub-County. The independent variables are the variables the researcher cannot manipulate or change which include the ICT facilities and infrastructure, ICT knowledge and skills and School administration. Learning and other outcomes is the dependent variable on the other independent variables as illustrated in the figure of conceptual framework. The ICT innovation and infrastructure in schools include hardware, software, internet connectivity and electrification. The kind of infrastructure available in

schools depends on the users and their knowledge and skills which is pre-service and the in-service training.

For efficient performance of ICT, there has to be adequate technical support and computer consultants to help solve technical problems for the teachers and the students to minimize time waste because of technical problems. The school administration should formulate ICT policies and plans as well as set ICT budget. These would influence innovations purchase in the schools in terms of quality and quantity. The administration should organize for staff development especially in-service training for teachers. The teaching load and the time schedule determine if the teacher have time to prepare ICT learning materials. The result of all these relationships is better learning and other outcomes such as; technology integrated lessons, change in teaching methods, and development of ICT curriculum and efficient use of computer by the students.

Figure 2.1 Conceptual framework on the relationship between variables

ICT infrastructural capacity

Level of teachers' ICT knowledge

ICT technical support

School administrative support

→

• Good KCSE geography performance • Level of ICT integration • Academic achievement • Timely syllabus completion • Teacher in-service training
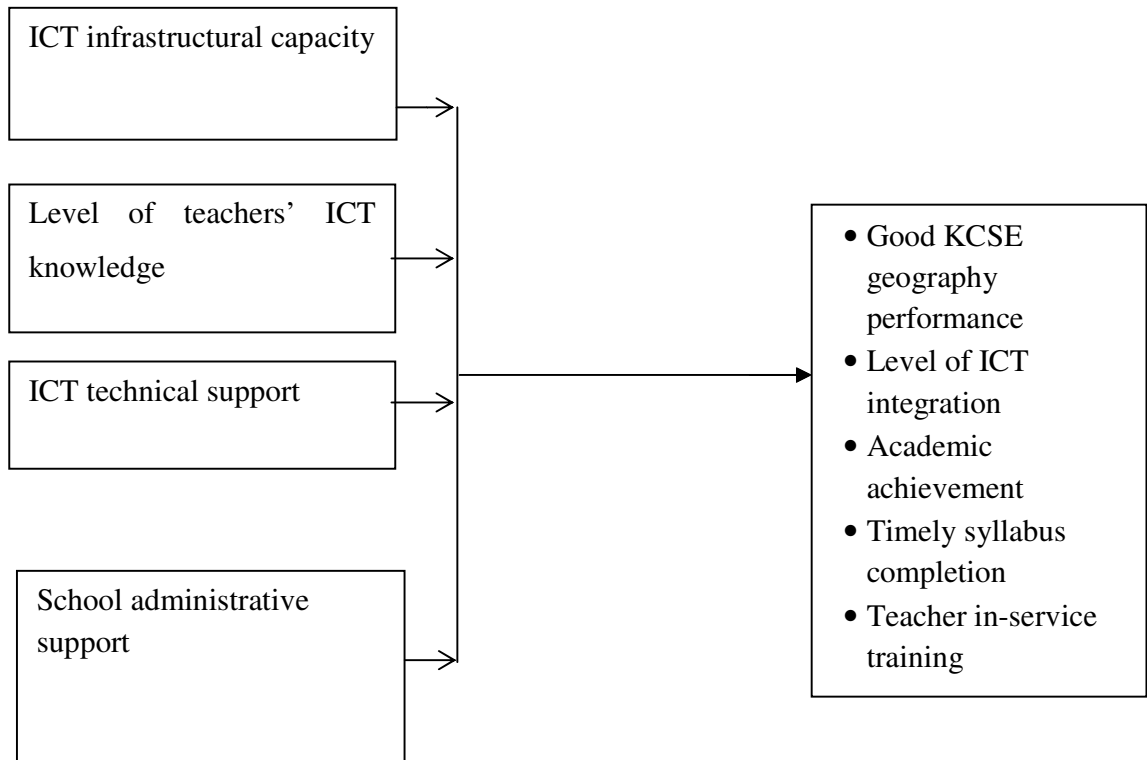
Source: researcher

CHAPTER THREE

METHODOLOGY OF THE STUDY

3.1 Introduction

The chapter describes the methodology of the study. It was presented in research design, locale of the study, target population, study sample, research instruments, validity and reliability of the instruments and the data analysis technique.

3.2 Research design

Research design refers to the procedures selected by a researcher for studying a particular set of questions or hypothesis; this includes the researcher's choice of quantitative or qualitative methodology, and how, if at all, causal relationships between variables or phenomena are to be explored (Orodho, 2009).

Non-experimental descriptive survey design was used to establish the factors that are influencing the integration and the use of ICTs in teaching and learning geography in secondary schools in Mwala Sub-County. A survey is a method of collecting information by interviewing or administering a questionnaire to a sample of individuals.

The study aimed at collecting opinions from the teachers and the principals about factors influencing adoption of ICT in teaching and learning geography. The secondary data was collected from literature review from the internet, journals and relevant books while questionnaires, observation and interview schedules enabled the researcher collect the primary data.

3.3 Target population

Target population is a set of people or objects the researcher wants to generalize the results of the research (Borg and Gall, 1989). In Mwala Sub-County there are

75 secondary schools, six provincial schools- three girls, another three boys schools, six district boarding schools-three girls schools and three boys schools, twenty three district boarding and day while fourty district day schools. There are 463 teachers in Mwala Sub-County. All the teachers and the principals made the study population.

3.4 Sample design and sampling procedure

Sample design is a definite plan determined before any data are actually collected for obtaining a sample from a given population, the statement about the sample should be true in relation to the population (Orodho, 2008). According to Mugenda and Mugenda (1999), for descriptive study 30% of accessible population is enough. Given that the target population is heterogeneous due to the nature of the schools in the region, stratified random sampling was used to allow full participation of the schools.

Twenty three schools made up the sample size representing 30% of the total population. To derive at the total schools sample schools were selected based on their school category where there provincial schools, boys school and girls school. The four district boarding schools include two boys' school and two girls' schools. The two provincial schools were included in the sample; in the district boarding category, two schools were sampled to represent each gender. The rest were sampled from the mixed boarding/day and day schools as outlined in the sample grid.

Four teachers were randomly picked to be the respondents in each sample school and twenty three principals were interviewed to represent each category of schools. This made a total of 115 respondents.

Table 3.1 Sample survey grid

School Category	Total number	Sample size	Percentage of total schools
Provincial	6	2	3 %
District Boarding	6	2	3 %
District			
Boarding/Day	23	7	30 %
District Day	40	12	30 %
Total	**75**	**23**	**68 %**
Respondents			
Teachers	463	25	12.0%
Principals	75	23	30.0%

Source: Researcher

3.5 Research instruments

These are tools that are used by the researcher to collect data from the sampled respondents in a study (Kombo and Tromp, 2006). The questionnaires were used to collect data from the teachers while the principals were interviewed. Observation helped to gather crucial information that could not be obtained through interviews and questionnaires. The questionnaires were used to collect bio-data of the teachers, background information of the schools and gather information on the use of ICTs in teaching and learning geography. Interview guide was used to gather information from the principals to establish the ICT policies use of ICTs in their schools.

3.6 Piloting

This is exposing the instruments to a small number of respondents to test the validity and reliability. The instruments were piloted in two schools and the procedure repeated in two weeks. Piloting helped the researcher to eliminate any ambiguity in the research instruments to ensure they generated valid results of the research. The schools where piloting took place were part of the study sample to avoid bias results of the study.

3.6.1 Validity of the instrument

Validity is a measure of how well a test measures what it is supposed to measure (Kombo 2006, Orodho 2009, Mugenda 1999). Validity is the degree to which results obtained actually represent the phenomenon under investigation. Validity was established through close consultation and expert judgment of the supervisors; they verified the validity of the research instruments used in the study.

3.6.2 Reliability of the instrument

Reliability is the measure of the degree to which a research instrument yields consistent results after a repeated trial (Mugenda and Mugenda 1999, Orodho 2009). An instrument that yields consistent results over time is said to be reliable (Wiersma,1985). Test-retest method was used to test the reliability and validity of the instruments. Test-retest technique involved administrating the same instrument twice to the same group within two weeks. Reliability correlation coefficient (r) was calculated using the spearman rank order. A correlation (r) of 0.80 was obtained which was higher than 0.75 as recommended by researchers

(Orodho 2009). This was considered high enough to judge the instrument as reliable.

3.7 Data collection procedure

The researcher got permit from the graduate school and the relevant authorities to undertake research. The DEO- Mwala Sub-County was contacted and informed the study took place in the region. The researcher visited the sampled schools and administered the questionnaires and conducted the interviews. Appointments to the sampled schools were arranged prior to the visits to avoid any inconveniences to the respondents. The researcher emphasized that the information given was specifically for the study and it was private and confidential and that names were not be necessary.

3.8 Data analysis and presentation

Data analysis refers to examining the data collected in the survey and making deductions and inferences. The data collected was analyzed using statistical package for social sciences (SPSS). This is a comprehensive, integrated collection of computer programmes for managing, analyzing, and displaying data (Orodho, 2009). Descriptive statistics are used to present the results of the study and the general trends which involve tabulating, graphing and describing data. A discussion of the finding followed that enabled the researcher to draw conclusions and give recommendations.

3.9 Ethical issues

The researcher personally administered the instruments to the respondents. A informed consent was sought from all the respondents so that the respondents voluntarily participated. The information collected was confidential and used for

the purpose of the study only. Clarifications were given to the respondents where need arose. There were no threats or victimization to the respondents who declined or withdrew from the study.

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND DISCUSSION

4.1 Introduction

This chapter presents the data analysis procedures employed to find out the factors that affect the effective integration of ICTs in teaching and learning geography in secondary schools in Mwala Sub-County. The study sought to assess the extent of ICT infrastructural capacity for teaching and learning geography; to determine the level of teacher's ICT knowledge and skills in application of ICT in; to establish the ICT technical support in teaching and learning geography and to establish the school administrative practices that supports the use of ICT in teaching and learning geography in secondary schools in Mwala Sub-County.

4.2 ICT infrastructure in schools

Use of ICT in education is directly dependent on the availability of necessary ICT infrastructure which include number of computers, electricity grid and internet connectivity. It was observed that most of the secondary schools have computers. Schools also had other ICT infrastructure which includes radio, televisions and DVDs which are mostly used for entertainment.

Teachers should be in position to access the computers so that they can use them in teaching and learning geography in class. The table 4.1 show how often teachers access the computer.

Table 4.1 How often teachers access the computers

How often the computers are accessed	Frequency	Percent
No response	4	3.0
Daily	40	35.0
Weekly	28	24.0
Monthly	10	9.0
Once a term	8	7.0
Never	25	22.0
Total	115	100

Only 35% of the teachers are able to access the computers daily, 24% access them weekly and 9% access them monthly while 22% of the teachers never access computers during the term. 3% did not reveal how often they access computers in the school.

These implies that majority of the teachers are not able to access computers often. Those who access the computers have varied use ranging from personal use to official use. The main use of computer among the teachers is to access the CD-ROMs and prepare assignments and test which is mainly done in the office. Research through the internet and encyclopedia was highly out of use by majority of the teachers.

The schools have made an effort to make internet connection available to the teachers where 68.7% of the teachers access the internet, 14.6% does not access the internet while 16.7% did not respond. The internet access is mainly through

the prepaid modems. The table below shows how teachers access the internet in schools.

Table 4.2 Internet connection in school

Internet connection	Frequency	Percent
Non respondents	72	63
Prepaid modem	40	35
Internet server	3	2
Total	**115**	**100.0**

The research revealed that 35% of the internet connection in schools is through prepaid modems and only 2% are connected through a server while 63% did not respond. This means that the access to internet is not only erratic but also very expensive because the prepaid modems are provided by the mobile phone service providers who are exorbitant in charge.

The teachers were asked to indicate the extent to which the following infrastructural factors affected their use of ICTs in class presentation. The table ,below presents percentages of how they responded to the statements presented in the questionnaire. SA- strongly agreed, A-agreed, u-uncertain, D-disagreed and SD-strongly disagreed.

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Table 4.3 The extent to which ICT infrastructure affect its use in class

Factor	SA	A	U	D	SD
Inadequate number of computers	41.7	45.8	4.2	8.3	0
Lack of internet connectivity	29.3	56.3	4.2	8.3	2.1
Lack of access to computers	31.3	50.0	2.1	14.2	2.1
Insufficient or irregular power supply	12.5	35.4	8.3	29.2	14.6
High cost of hardware and software	31.3	45.8	8.3	10.4	4.2
Unavailability of appropriate software	16.7	52.1	14.6	6.3	10.4

41.7% of the teachers strongly agreed that inadequate number of computers hinder them from using them in class, while 45.3% agreed, 4.2% were uncertain while 8.3% disagreed and none strongly disagreed. Teachers also felt that lack of internet connectivity also contributed to the slow use of ICTs in teaching and learning geography; 29.3% strongly agreed, 56.3% agreed, 4.2% were uncertain while 8.3% disagreed and 2.1% strongly disagreed.

Teachers revealed that they lack regular access to the computers in their schools; 31.3% strongly agreed, 50.0% agreed, 2.1% were uncertain while 14.2% disagreed and 2.1% strongly disagreed. This makes it even harder to prepare ICT based class lessons. More to this, there was insufficient or irregular power supply in the schools; 12.5% strongly agreed, 35.4% agreed, 8.3% were uncertain while 29.2% disagreed and 14.6% strongly disagreed.

High cost hardware and software made it challenging for the teachers to acquire appropriate ICT facilities in schools; 31.3% strongly agreed, 45.8% agreed, 8.3% were uncertain while 10.4% disagreed and 4.2% strongly disagreed. The teachers also pointed out the little hardware and software available was not appropriate for efficient use in class; 16.7% strongly agreed, 52.1% agreed, 14.6% were uncertain while 6.3% disagreed and 10.4% strongly disagreed.

4.3 ICT Knowledge and skills of teachers

Proper use of ICT is not possible without knowledge, skills and experience to use the available infrastructure in the schools. ICT knowledge and experience depend of teachers' pre-service and in-service training and the research revealed that teachers have varied academic and ICT professional training.

4.3.1 Gender distribution of the respondents

The research targeted 72 teachers who responded to the questionnaire and 23 principals were interviewed. It was important to understand the composition of the sample population in terms of their gender. The figure 4.4 below shows the gender distribution.
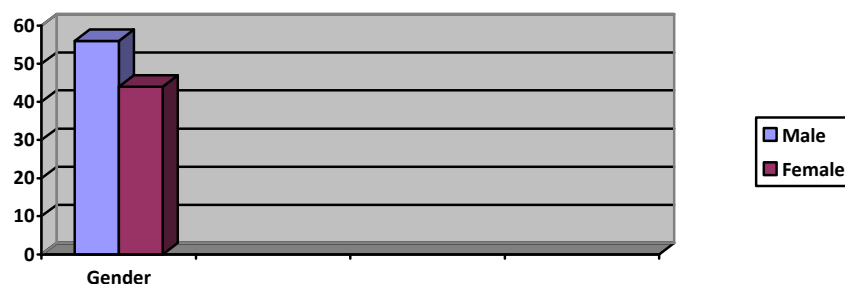
Fig. 4.1 Gender distribution of the teachers

Out of the 92 teachers 56% were male while 44% were female. Majority of the respondents were male compared to the female. This was so because upon

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observation there were more male teachers than female teachers in the schools sampled.

4.3.2 Academic qualification of the teachers

The teachers have varied academic qualifications ranging from diploma to masters. The researcher sought to understand the academic qualification of teachers by establishing whether they hold master degree, bachelor degree, and post graduate diploma in education or diploma certificate. The table below presents the details on academic levels of the teachers sampled in the study.

Table 4.4 Level of education of teachers

Level of Education	Frequency	Percent
Masters	17	15
Degree	60	52
PGDE	10	9
Diploma	28	24
TOTAL	**115**	**100.0**

Out of the 115 teachers sampled in the research, 60 teachers are degree holders which represent 52%, 28 are diploma holders which is 24%, 17 are master degree holder which is 15% and the rest are PGDE holder which is 9%. Majority of the teachers who responded had less than five years of teaching experience at 47.9%, 5-9 years of experience were 20.8%, 10-14 years were 10.4% while those with teaching experience of above 15years were 20.8%.

4.3.3 Level of ICT training

The literature review revealed that for proper use of ICTs in schools teachers should have adequate computer skills (Tin 2002). The researcher wanted to establish the teachers' level of ICT knowledge and skills that would enable them to use computers at personal or professional level. The table below outlines the level of ICT training among the teachers who took part in the study.

Table 4.5 Level of ICT training

Level of ICT training	Frequency	Percent
Unknown	46	40
Proficiency computer Packages	65	57
Diploma in ICT	4	3
TOTAL	**115**	**100.0**

It was observed that 57% of the teachers have certificate in computer application packages while only 3% had a diploma in ICT while 40% did not disclose the level of ICT training. This showed that a big percentage of the teachers have the ability to use the computers although their ICT skills are not so advanced.

4.3.4 Average number of lessons per week and lessons per day

Time is a crucial resource for preparation of ICT materials by the teachers. 75% of the teachers teaches an average of 25 lessons and above per week. This implies that the teacher have a very high teaching load to have time to prepare the ICT materials required in class. Majority of the teachers have an average of 5 lessons per day 54.2%, 16.7% have 6 lessons per week. This is coupled with the co-

curricular activities after the school programme. This means that 70.9% have 5-6 lessons per day.

4.4 The impact of using ICTs in teaching and learning geography

The researcher undertook to understand what were the feelings of the teachers in use of ICTs in teaching and learning geography. Where all the teachers strongly agreed that use of computers would improve efficiency and effectiveness in school. The table, below presents percentages of how they responded to the statements presented in the questionnaire. SA- strongly agreed, A-agreed, u-uncertain, D-disagreed and SD-strongly disagreed.

Table 4.6 Impact of use of ICTs in teaching and learning geographys

Impact of use ICTs in teaching and learning geography	SA	A	U	D	SD
There is increased use of micro-soft applications	37.5	35.4	18.8	4.2	4.2
There is increased instructional materials in the internet	39.4	45.8	6.3	4.2	4.2
ICT would improve the presentation in class	45.8	45.8	8.3	0	0
The use of ICTs would improve productivity in class	33.3	52.1	6.3	6.3	2.1

There is increased use of micro-soft office applications in general where 35.4% agreed and 37.5% strongly agreed. 18.8% were uncertain while 4.2% disagreed and 4.2% strongly disagreed. To add to this, the teachers conquered that there is increased instructional materials in the internet where 39.4% strongly agreed, 45.8% agreed 6.3% were uncertain, 4.2 disagreed and 4.2 % strongly disagreed.

More to these the teachers agreed that ICT would improve the presentation of work in class where 45.8% strongly agreed, 45.8% agreed and 8.3% were uncertain. In addition, 33.3% strongly agreed, 52.1% agreed, 6.3% uncertain, 6.3% disagreed while 2.1% strongly disagreed that ICTs would improve class productivity.

4.5 Technical support in teaching and learning geography

Technical support in ICTs is crucial as established in the literature review because it would reduce anxieties associated with new technologies. The research revealed the following in relation to ICTs technical support in schools. The table below indicate percentages of how the teachers agreed or disagreed to the technical related factors in use of ICTs in class. SA- strongly agreed, A-agreed, u-uncertain, D-disagreed and SD-strongly disagreed.

Table 4.7 ICT Technical support to teachers

Factors	SA	A	U	D	SD
Lack of technician to help teachers with the computer hardware or the software	20.8	56.3	2.1	18.8	2.1
High cost of computer maintenance and upgrading	29.2	45.8	4.2	12.5	8.3
High cost of staff training on computer maintenance	6.3	47.9	8.3	31.3	6.3
Fear of computer and technology breakdown during teaching process	8.3	33.3	10.4	31.3	16.7
Frequent breakdown of computer and other digital equipment	10.4	35.4	8.3	33.3	12.5

Access to technical support by the teachers on hardware and software was a big challenge. 20.8% strongly agreed that there was lack of technical support, 56.3% disagreed, 2.1% were uncertain, 18.8% disagreed and 2.1% strongly disagreed. High cost of the computer maintenance and upgrading also limited teachers where 45.8% agreed, 29.2% strongly agreed, 4.2% were uncertain while 12.5% disagreed and 8.3% strongly disagreed.

The teachers also felt that there were high costs of staff training on simple basic skills of computer maintenance; where 6.3% strongly agreed, 47.9% agreed, 8.3% were uncertain while 31.3 % disagreed and 6.3 % strongly disagreed.

There was mixed responses on the assumption that teachers feared computer and technological breakdown as they teach. Where 8.3% strongly agreed and 33.3% agreed 10.4% were uncertain while 31.3 % disagreed and 16.7 %strongly disagreed. Frequent breakdown of computers and other digital equipments during teaching and learning geography had the following results; 10.4% strongly agreed, 35.4% agreed 8.3% were uncertain while 33.3 % disagreed and 12.5 %strongly disagreed

4.6 Administrative practices that influence the use of ICT in schools

It was observed that the computers in the schools are mainly located and used in the office for office practices. Out of the four principals interviewed, only one that had a school policy on use of ICTs in school contained in this school's strategic plan of five years. The others did not have a clear cut strategy on how to integrate use of ICTs in teaching and learning geography in their school.

The interviews conducted to the principals had the following outcome. Two of the principals had 6-10 years of experience as principals in different institutions. The other two had experience of 1-5years. One of them was newly posted to the institution. They all had one thing in common that there was lack of technological culture in teaching and learning geography in their schools.

Two principals in the day and mixed boarding/day schools revealed that in their schools there was no clear ICT budget and the costs of ICTs are integrated in other vote heads like tuition this represented 50% of the total interviewed. One of the other principal in the district boarding school-25% revealed that their ICT budget is purely financed by the parents which include human resource. The principal of the provincial school was reluctant to respond on budgetary issues.

None of the principals interviewed had benefitted from the government economic stimulus programme of providing ICTs in secondary schools. The principals also noted out that they did not have specialized ICT teachers in their schools and employing teachers was an additional strain to already an over stretched budget. This was very common in the day schools which did not ask for extra money from the parents apart from the fees as guided by the ministry of education.

4.7 Discussion of findings

The use of ICTs in class has the potential to improve the presentation in class; but there is limited use of ICTs in the secondary schools. The research findings attributed this limited use to:

Limited number of computers in schools: The number of computers in the schools was evidently low where 56.3% have less than five computers, 10.4% have ten to fifteen computers, 18.8% have fifteen to twenty computers while 14.6% of the

total number of the schools sampled have 20 computers and above. This makes them inadequate and inaccessible for use by the teachers and the students because most of them are found in the office. Very few schools use them to access video compact disk or even listen to the radio broadcast as aired by the Kenya Institute of Education (KIE). In the literature review Afshari (2009) states that limited access to computers is a barrier to effective use of class.

Limited internet connectivity: There is low internet connectivity in the secondary schools. 66.7% of the total internet connection is dependent on the prepaid modem while only 2.1%have their connection through the internet server. The overreliance on the modem as the main access to the internet is expensive and often disrupted by slow connectivity. It was evident that the use of the internet is mainly personal to communicate with friends -and search for personal materials from the internet 39.6%. Only 27.1% use the internet to research for teaching learning materials. Jensen (2002) in his research finding had outlined unreliable telecommunications networks form a major hindrance for many people in Africa to use ICTs this also applies on education.

The insufficient power supply in most of the secondary schools in the region had contributed to the slow integration of ICTs in the schools. This was because most of the secondary schools were in the rural areas where there is inadequate electricity supply especially in the day schools coupled with inadequate power backup. Conradie (2003) had observed that many rural areas in Africa do not yet form part of the national electricity grid. This is particularly an acute problem since technology and internet can only be effective if it is generated by electricity.

Unavailability of appropriate software: Though there is general agreement that ICTs can improve class presentation, there is lack of appropriate software for presenting this information in class for both the teachers and the students. Tin (2002) explains that proper use of ICTs require substantial pedagogical component in IT curriculum and development of specific software for use in teaching and learning geography.

Insufficient amount of pre-service training: the teacher training programs have not adequately incorporate ICT training in the teacher training programmes. This is because most of the teachers agreed to that they have limited pre-service training before they are deployed in the schools. Also lack of time for in-service staff training: The teachers have on average 25 lessons per week and 5 lessons which is high. This meant that the teachers don't have adequate time for in-service training. Given that ICT knowledge is highly obsolete teachers need regular refresher courses to keep them up-to-date with the latest technology and technological changes. Poor training had created resistance to change involving use of technology in teaching and learning geography as was also observed by Albirini (2007). Any new changes leave the teachers disadvantaged on how to go about the use of computers in their daily duties.

Inadequate teacher training on computer maintenance: This leaves teachers unable to handle computer breakdown in the absence of technicians in the schools. The teachers also accepted that there was regular computer breakdown which interrupt classroom progress and that they fear to use computers in class because of inadequate technical support. This confirms Minishi-Mananji (2007) findings

there are not enough ICT specialists at the speed at which the technologies are adopted.

There are few teachers deployed to teach computer skills in schools as revealed by the principals interviewed. The lack of teacher who specializes in teaching computer related knowledge leaves the students unable to use the ICTs available in their schools appropriately. Teachers also lack familiarity with good practice rooted on understanding of how to use ICTs because of lack of ICT policy in their schools. This confirmed Mureithi and Munyua (2006) findings that ICT policy gives opportunity for establishment grass root infrastructure for knowledge sharing.

High cost of hardware and software: the principals interviewed confirmed that the cost of hardware and the software is high hence a major hindrance in the integration of ICT in teaching and learning geography. Budget constraints in the schools cannot allow the principals to make investment in training their teachers on the use of computer programs in the class. At the same time the heads of the schools fear that after training the teachers they can also transfer to other schools making the training given to these teachers inappropriate use of the already scarce financial resources in the schools. Frank (2007) observed that constraints exist due to lack of commitment of school administrators to new modes of instructional practices.

High cost of computer maintenance: The cost of computer maintenance is high. The schools work on a constrained budget that is highly regulated by the

government. Any extra charges are restricted while on the other hand there is very little support by the government in the support of ICT programs in schools which includes poor staffing in the schools. Cost of computer accessories is high as the principals disclosed. To save on these costs they are forced to develop policies restricting the use of computer related materials which further disadvantages the teachers and the students. The MHEST and NCST (2010) also revealed the financial constraints in the integration of ICTs in schools

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of the study findings, discussions, conclusions and recommendation of the research. The chapter also contains suggestions of related studies that may be carried out in the future.

5.2 Summary of the study findings

The study findings have revealed that integration and use of ICTs in the secondary schools in Mwala Sub-County is hindered by so many factors. Inadequate infrastructure: this includes inadequate number of computers in the schools, inadequate power supply, limited internet connectivity and inappropriate hardware and software. Teachers have poor pre-service training in ICT because only very few have a diploma in ICT. This is coupled by lack of enough time for in-service training and a high teaching load which leaves them with very little time to prepare the teaching and learning geography materials for use in class. Students on the other hand lack the skills to use computers in their schools.

Technical help is inadequate despite regular computer breakdown of the old computers. This not only wastes time but also leaves the teachers unable to continue using ICTs in class. The administrative practices include financing computer programmes in school and facilitating in-service training of the teachers as well as employing teachers to teach computer skills. Most schools lack ICT policies that would enable proper integration of ICTs in teaching and learning geography. High cost of ICT maintenance pushes the principals to cut down on the use of ICTs in teaching and learning geography.

5.3 Conclusion

The ICTs have great advantage in improving all sphere of life including education. The researcher therefore concludes that the interplay of factors have negatively influenced and slowed the use of ICTs in teaching and learning geography in secondary schools. This includes unavailability and inappropriate ICT infrastructure in the secondary schools; limited ICT knowledge and skills for both the teachers and the students characterized by inadequate time for in-service courses for teachers; limited technical support during teaching and learning geography process and restrictive administrative practices mainly limited budgetary allocations and lack of proper ICT policies in the secondary schools. Therefore there has been limited use of ICTs in class presentation in secondary school.

5.4 Recommendations

Based on the findings of the study, the researcher recommends that:

The government should invest heavily to provide adequate number of computers in schools and also enhance internet connection in the schools to ensure easy access to teaching learning materials in the web. Electrification should be diversified in the rural areas to enhance the use of computers. Alternative sources of energy can be used in the remote places where it is very expensive to provide adequately. Power back up system can help solve the problem power interruption.

The ministry of education should develop pre-service and in-service staff training programmes that are tailored to the school programmes to keep teachers up to date with the technological changes which will promote proper integration of ICTs in teaching and learning geography. More teachers should be deployed to

the schools to train the students on the use of computers for more to increase the confidence when learning using ICTs. There should be ICT technician at the regional education levels to help teachers with the computer hardware or the software they would assist the teachers handle any computer breakdown.

The school administration should familiarize themselves with the national ICTs policies and especially in education in order for them to develop school ICT policy that would enable them integrate use of ICTs in teaching and learning geography in class. Government should make available avenues in which the schools can acquire computers at a reduced cost. This can be done through tax waiver on computers meant for learning in the secondary schools.

5.5 Suggestions for further studies

i.   This study was carried out in one sub-County only; a similar study could be carried out in the other sub-Counties.

ii.   A study could be carried out to find out the factors that influence the use of ICTs in the private secondary schools.

iii.   A study can be carried out to determine the cost- benefit analysis of using ICTs in secondary schools.

iv.   A comparative study can be carried out on the impact of using ICTs in secondary school performance.

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APPENDICES

Appendix 1: INTRODUCTORY LETTER

P.O BOX 314-10204,

Nairobi.

Dear Sir/Madam,

REF: RESEARCH PROJECT

I am a student pursuing a post graduate diploma at the University of Nairobi. I am undertaking a research project on influence of integration and use of ICT in teaching and learning geography in secondary schools in Mwala Sub-County. The information gathered will treated confidential and strictly used for academic purpose only. Please provide honest and correct information according to your own views objectively in the questionnaire provided.

Thank you.

Yours faithfully

Benedict Musyoka Musyoki

Appendix 2: QUESTIONNAIRE FOR TEACHERS

INTRODUCTION

The researcher is carrying out a research on influence of integration and use of ICT in teaching and learning geography in secondary schools in Mwala Sub-County. Please don't write your name on the questionnaire. Answer the questions objectively and provide accurate information to the best of your knowledge. Use a tick (√) to show your response where applicable, response can also be written.

Section A: BIO-DATA

(i) Gender   Male   Female

(ii) Level of professional training

    Masters   Degree and PGDE

    Degree   Diploma

(iii) Teaching experience

    15 years and above   5-9 years

    10-14 years   Below 5 years

(iv) What is the level of ICT training?

Certificate Proficiency packages ☐

Diploma in ICT ☐

(v)   What is the average teaching lesson per week? _____

(vi)   What is the average lesson per day?_____

Section B. SCHOOL BACKGROUND

i)   Kindly indicate your school's category

Provincial   [ ]   District boarding/day [ ]

District boarding   [ ]   District day   [ ]

    ii)   Does your school have computers? Yes   [ ]   No   [ ]

    iii) If yes how many?

    iv) Where are the computers placed?

       Office   [ ]   Staffroom   [ ]

       Computer lab [ ]   Classroom   [ ]

    v)   How often do you access the computer?

       Daily   [ ]   Once a term   [ ]

       Weekly   [ ]   Never   [ ]

       Monthly   [ ]

    vi)   Preparation of teaching- learning materials

       PowerPoint presentations   [ ]

       CD-ROM materials (VCD/DVD)   [ ]

       Assignments and tests   [ ]

    vii) Do you have internet connection in schools? Yes   [ ]   No [ ]

    viii)   If yes, how are you connected?

Pre- paid modem   [ ]   Internet server [ ]

    ix) How do you use the internet?

Statement	Frequently	oftenly	Never
Communicate with friends and family			
Communicate with other teachers or students on school related matters			
Search for personal information			

Search for teaching and learning geography materials			

x) Apart from computers, what are other telecommunication facilities in

school?

Facility	RADIO	TV	DVD	VCR
Number				

xi) How are the facilities used?

Entertainment [ ] Access broadcast lessons [ ]

Access CD- ROM learning materials [ ]

C. ICT INTEGRATION IN TEACHING AND LEARNING GEOGRAPHY

Indicate the extent to which you agree with the following on ICT integration in
teaching and learning geography.SA-Strongly agree, A- Agree, U- Uncertain, D-
Disagree, SD- strongly disagree

Impact	SA	A	U	D	SD
There is increased use of micro-soft office applications					
There is increased instructional materials in the internet					
ICT would improve the presentation of work in class					
Students use the multimedia technology					
Provision of professional support through the internet (online learning)					
Improve productivity					

Section D. ICT INFRASTRUCTURE AND ACCESS

Indicate the extent to which the following factors affect the use of ICT in teaching and Learning. SA-Strongly agree, A- Agree, U- Uncertain, D- Disagree, SD-strongly disagree

Factor	SA	A	U	D	SD
Inadequate number of computers					
Lack of internet connectivity					
Lack of access to computers					
Insufficient or irregular power supply					
High cost of hardware and software					
Unavailability of appropriate software					
Structural arrangement of computers					
Computers are very old and slow					

E. ICT KNOWLEDGE AND SKILLS

Can computer improve the efficiency and effectiveness in teaching and learning geography in schools? Yes [ ]   No   [ ]

If yes, why do you think this has not been achieved? SA-Strongly agree, A- Agree, U- Uncertain, D- Disagree, SD- strongly disagree

Reasons	SA	A	U	D	SD
Lack of finance to train on use of ICT programs					
Insufficient amount of pre-service training on ICT					
Lack of time for in-servicing staff on ICT					

Lack of familiarity with good practice rooted on understanding of how learners learn				
Lack of adequate students training on how to use the computers				

Section F.: TECHNICAL SUPPORT

Indicate to what extent the following factors influence integration of ICT in teaching and learning geography. SA-Strongly agree, A- Agree, U- Uncertain, D- Disagree, SD-strongly disagree

Factors	SA	A	U	D	SD
Lack of technician to help teachers with the computer hardware or the software					
High cost of computer maintenance and upgrading					
High cost of staff training on computer maintenance					
Fear of computer and technology breakdown during teaching process					
Frequent breakdown of computer and other digital equipment					

Section G. SCHOOL ADMINISTRATION

Indicate the extent to what do you agree that the following reasons influence the adoption of ICT in school. SA-Strongly agree, A- Agree, U- Uncertain, D- Disagree, SD- strongly disagree

Factor	SA	A	U	D	SD
Lack of enough time to research and prepare digital materials for the class					
Inadequate scheduled time and opportunities to interact and share experience of rising new technologies with peers					
Lack of time for training and exchange ideas with experts on how to use new technologies					

THANK YOU

Appendix 3: INTERVIEW GUIDE FOR PRINCIPALS

1. What is your gender? Male   [ ]   Female   [ ]

2. Year of experience as a principal

   Above 15 years   [ ]   6-10 years   [ ]

   11-15 years   [ ]   1-5 years   [ ]

3. Does   your   school   have   ICT   policy   and   plan?

   _____

4. Does your school have a culture of technology use i.e. in teaching and

   learning geography?_____

5. How   many   computers   do   you   have   in   your

   school?_____

6. How   did   you   acquire   them?_____

   _____

7. Is your school connected to the internet? _____

8. What is the main use of the internet? _____

9. What is the estimate budget of ICT in you school and how do you finance the

   budget?_____

10. Does the government grant any extra funds for the ICT education at your

    school? Yes   [ ]   No   [ ]

11. If yes how do you use the budget allocation?_____

12. To what extent does the following ICT necessities influence integration of

    ICT in geography teaching and learning use the following key: 1 = To a large

    extent , 2 = to little extent and 3 = not at all

Statement	1	2	3
a. Classroom infrastructure; the purchase of hardware and software			
b. Supplement of running and working expenses			
c. Human resource development including hiring and training teachers			

13. Does your school have a teacher(s) who specialize in ICT education? _____

14. Who pays them? PTA/BOG or Government _____ any other specify _____

15. Are the teacher given a chances and opportunities to learn to integrate computers into their classroom practices? _____

16. Do you believe that teacher are motivated adequately to use ICT in teaching and learning in terms of: Training   [ ]   Administrative support [ ]

17. Do you think teaching load for teaching influence use of technologies in teaching and learning geography? _____

Appendix 4: OBSERVATION SCHEDULE

Upon visiting the schools the researcher will seek to make the following observations in the schools.

1. Presence of a computer laboratory

2. The number of computers in the school

3. The main location of computers

4. Presence of other telecommunication facilities

5. If there is electricity supply and a generator for power back-up