

**FACTORS INFLUENCING THE INTEGRATION OF  
INFORMATION COMMUNICATION TECHNOLOGY IN  
TEACHING AND LEARNING IN SECONDARY SCHOOLS:  
A CASE OF MATUNGULU SUB COUNTY, MACHAKOS  
COUNTY**

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## DECLARATION

This Research project report is my original work and has not been submitted in any other University.

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This Research project report has been submitted for award with my approval as University supervisor.

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## **DEDICATION**

This project is dedicated to my wife Elizabeth M. Katithi and our children, Samuel Kanyoi and Joy Mwende.

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## **LIST OF ABBREVIATIONS AND ACRONYMS**

CCK	-	Communications commission of Kenya
ESP	-	Economic stimulus programme
GeSci	-	Global e-school and communities initiative
GIS	-	Geographic information systems
ICT	-	Information Communication Technology
LDCs	-	Less developed countries
NACOSTI	-	National Commission for Science, Technology and Innovation
NEPAD	-	New partnership for Africa's development
OECD	-	Organization for Economic Cooperation and Development
SPSS	-	Statistical Package for Social Sciences
STI	-	Science, Technology and Innovation
UNESCO	-	United Nations Educational, Scientific and Cultural Organization
UON	-	University of Nairobi
UPS	-	Uninterruptible Power Supply

## ABSTRACT

In the present world, the use of information technology is inevitable in all sectors of development. All levels of teaching institutions have no option but to fit in the wave of using IT in their daily activities. The purpose of this study was to establish the factors that influence the integration of ICT in secondary schools in Matungulu Sub County, Machakos County. The study sought to determine the influence of infrastructure availability and accessibility; teachers' ICT competence; teacher's attitude; and teaching experience on integration of ICT in education in secondary schools. The research design for the study was descriptive survey design. The target population was 4912 respondents comprising of 11 principals, 168 teachers, 22 support staff and 4711 students. The sample size was 343. The sample comprised of 2 support staff, 328 students, 1 principal and 12 teachers in selected schools in Matungulu Sub County, Machakos County. Data was collected by use of questionnaires and interview guides. Statistical Package for Social Sciences was used to analyse the quantitative data which is presented in tables while qualitative data from interview guide is analysed by use of content analysis. The major findings are the existence of a large number of staff who have no prior training in ICT and could not help in the integration of ICTs, inadequate ICT infrastructure, principal leadership and ICT literacy that play significant role in ICT integration in teaching and learning. The ratio of learners to computers is 1:11 meaning that computers are inadequate. Both principals and teachers agreed that there were computer laboratories in schools but computers were inadequate for use in teaching and learning. In regards to teacher's ICT competence and ICT integration, the study found that majority (58.3%) of respondents were able to use word processing and spread sheets in preparation of lesson, (33.3%) disagreed, (8.3%) strongly disagreed and (0.0%) strongly agreed to the statement. In respect to teacher's attitude and ICT integration, (25.0%) of respondents agreed, (66.7%) disagreed, (8.3%) strongly disagreed and (0.0%) strongly agreed that ICT tools are difficult to use. This implied that there was no statistical significant relationship between the categorical variables since the Cramer's V is 0.098 approximately 0.1 (Small effect), hence teachers' attitude on ICT integration has a small effect size in this study. The study also established that, (58.3%) of the teachers had experience of less than 10 years in teaching, (33.3%) of teachers had experience in teaching between 15-24 years, while those with experience of 10-14 years were (8.3%) and there were no teachers with an experience of more than 24 years. The researcher recommends that the government through the Ministry of Education should ensure adequate ICT infrastructure in all public secondary schools. Teacher training should also involve compulsory ICT training to enable teachers to possess required ICT skills necessary for integration in teaching and learning.

# CHAPTER ONE

## INTRODUCTION

### 1.1 Background of the Study

Many Africa governments have attempted to add insistence in education especially since attainment of independence. It has resulted in increased budget grant in education sector (UNESCO, 2000). The advance is driven by the fact that education is the keystone to economic growth and development. Education assists to alleviate penury and its consequences by developing human capital therefore accelerating the degree of social and private gains. Governments, particularly in the less developed countries (LDCs) have also been reforming their education system, to make education a successful conveyance for national development (Abagi and Odipo, 1997). ICT is presently at the forefront in the education reforms that require its usage in coordination of the changes in curriculum, pedagogy, teacher training, and evaluation (Kozma, 2000). ICT is a fruitful instrument if amalgamated successfully forms a pointer support to education training (Tomar and Kumari, 2005).

The integration of IT into practically all facets of the economy and society is generating a digitally enabled economy that is accountable for producing economic progress and affluence (Ballou, 2006). Maguire (2003) additionally notes that ICT sector has the prospect to spawn economic growth and initiate alleys into the knowledge economy. The endorsement of ICT in the execution of education isn't something that started with the arrival of the new digital platforms; technologies like radio, telephone and television have always been in existence, and continue to be used even presently what is new are the various methods that they can be joined and merged with the new emerging technologies

which mostly contemplate use of computers (Farrer, 2007). There is an increasing attraction in the usage of computers at the secondary level to boost instruction which incorporates a diversity of uses, mostly exploiting 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 construct human abilities and freedoms and at the same time provide students the chance to learn how to utilize electronic devices to access information and develop research skills in tackling queries. United nations and the world bank noted that ICT can elevate access to education network for learners, train teachers and widen availability of quality education material for upcoming international economies (world bank, 2003). Trucano (2005) reiterates in the adoption and utilization of information communication technologies (ICTs) in education establishments in the developing countries remain quite restricted notwithstanding a decade of huge investments in information and communication technologies. Information and communication technology (ICT) provides a window of a moment for educational institutions and other stakeholders to tack and utilize technology to supplement and assist the learning and teaching activities. According to OECD (2004) Kenya, similar to other developing countries strives with high degree of poverty and this has an effecting access and adoption in ICT. The existing objective to institute ICTs in education was firstly at developing ICT skills. However, there has been a paradigm shift in application of ICTs both at Secondary and Tertiary institutions.

Availability and application of these ICTs at both levels remain wanting. Kenya ICT survey (2007) notes that about 1300 secondary schools from the total of 6000 have computers, whilst majority of the schools with computers utilize below 40% of the available infrastructure and quite a few literally use ICT as a substitute technique for curriculum delivery. This depicts quite a slow amalgamation pace in the Kenya education sector. The Kenyan education system is under intense pressure to apply new information and communication technologies (ICTs) in teaching students the skills and knowledge required in this 21<sup>st</sup> century.

In the past, new ICT appliances have fundamentally changed the methods people communicate and transact business. In this view, they also possess the capability to modify the nature of education where and how learning is undertaken and the position of teachers and students in the learning activity (Muriithi, 2005). Vision 2030 targets to turn Kenya into worldwide competitive and prosperous nation with a superb standard of life through education (under social pillar) achieved by encompassing adoption of Science, Technology and Innovation (STI) as an enactment apparatus. Sessional paper No. 14 of 2012 states that for education should be transformed to meet the 21<sup>st</sup> century needs for education and training through equipping the labour force with the essential skills to engage and compete in the turbulent economy of knowledge.

The predominant obstacle facing the Kenyan education system is how to revamp the curriculum and teaching-learning procedure to equip students with skills to operate effectually in this vigorous information-rich, and continuously changing environment. ICTs present an array of powerful devices that may aid in revamping the present isolated,

teacher-centred and the text-bound classrooms into endowed, student-focused, interacting knowledge environment. These bottlenecks can only be found if institutions (secondary schools) adopt new emerging technologies and adequate ICT devices for learning (Wang, 2007). Amutabi (2004) points out that, from the 1980s combination of ICT in education has been mandatory in the developed nations, this is not the case in developing world countries like Kenya, ICT featured around 2005 as a preferred sections identified. A first draft ICT strategy was completed in August 2005.

The School stewardship give the direction and support in terms of school policy that determines aims and also the imperative wealth for the teachers. Fruitful change and ICT administration in schools relies upon productive leadership (Hepp, 2004). Effective and coherent leadership is a crucial aspect in starting and maintaining the impetus to promote quality ICT integration. According to Afshariel (2006), the principal of a school is the pivotal agent of change, who has a definite vision and implementation strategy for ICT with the major components being staff development geared on curriculum tailoring and pedagogic innovation. From research, they concluded that school principals have a major part in the facilitation of change in education.

Particularly now when information and communication technologies are being incorporated into the classroom as appliances for learning, and when teachers are required to merge technology into the practices of teaching, principals who show an initiator style are most probable to attain success in their respective schools. However, these leaders in education should be equipped with the skills and understanding for both technical and pedagogical application. According to the research above, the principals



provided support through stressing classroom utilization of technology during staff meetings. Organizing for staff training, ensuring sufficient time and resources for in-class computer utilization, and monitoring individual teacher's progress by revisiting instruction plans and other written documents. According to MCEETYA, Australia (2006), school leadership should equip teachers with imperative resources and professional opportunities for learning, link teachers to each other, and to experts and resources above the school, involve teachers in teaching and learning of curriculum, evaluation, decision making and reporting, leverage the competencies of students and their desire to adopt ICT.

MCEETYA notes that transitional leadership that amalgamates information and communication technologies ICT to improve learning and teaching will be required in schools. Such leadership traces and manages the accessibility to, and impact of ICT on all parties of students, involves ICT ethics to all students, culture sensitive and gainful means, and sets up an entire school planned and sustained ICT incorporated program with high standards technical support among others. In the 21<sup>st</sup> century, visionary leadership is needed that recognizes the vital task of teaching in making sure the ability of information communication technologies is employed to change pedagogies and learning in schools. The leadership is charged with the responsibility on teachers development in knowledge competencies, skills and confidence to execute professional judgement for utilizing ICT platforms in learning.

According to Yang (2008) concurs that absence of technical assistance was one of the major setback that caused underutilization of computers in the classes. Its argued that

absence of training aid by administrators can be viewed as a recognized obstacle towards implementation of computers in classes as emphasized by Krysa (1998). Webb (2007) has thus classified, barriers to ICT integration into three levels: the teacher and this usually to do with competence, motivation and training; the school: especially restricted ICT access and the absence in ICT dimension throughout the overall school strategy: and the school system: rigidity of the school system, especially when linked with the wider educational framework. There are noticeable large hiatus between policies and changes in classroom exercises that are meant to affect (Cohen and Hill, 2001). This implies that policies are articulated but the teachers are seldomly unaware of the particulars of these said policies or their purposes. Subsequently, policies are affected as programs, but rarely these programs aren't successful in attaining anticipated change at the classroom stage.

A research by Cohen and Hill (2001) established that policies were sufficiently applied in classroom in cases where teachers had added moments of learning policy-related documents. Apart from this it has been greatly noted that learning is a procedure of interception between students and teachers as both take part in the learning activity, but with more emphasis being on teachers to lead the way. Consequently, to efficiently and effectively combine ICT in primary education, teachers are at the centre of the activity. In this manner, teachers are required to possess knowledge in management skills related to the incorporation of ICT. Therefore, the study intends to evaluate the position of secondary school teacher's knowledge and skills in ICT applications mandatory for the implementation of ICT incorporation in education sector.

## **1.2 Statement of the Problem**

Readiness to apply ICT to learning and teaching is of essence in that when adaptation of ICT utilization in teaching, it enhances productivity and course delivery. Subsequently most teachers don't facilitate much to the students utilization of computers for learning processes (Becker, Ravitz & Wong, 1999; de Corte, 1990; Karsenti & Tchameni, 2007, Newhouse, 1999).

By 2010, over 790 million adults didn't possess writing and reading skills, which comprised 64 per cent being woman, a large number being in sub-Saharan Africa, south Asia and West Asia (UIS, 2011). Proof depicts that slightly over 200 million youth require a second chance to acquire literacy and numeracy skills that are important for them to be ready for new job opportunities in future times (UNESCO, 2012). In Kenya research indicates that most secondary schools have ICT facilities. Comprising of computers, computer laboratories, internet connectivity, together with the traditional means of telecommunications. However, teachers do not make real use of these facilities, leading to a slow pace in the integration process. Despite the government's effort to install electricity in public schools, some schools in the rural areas still lack electricity while power outages are a common phenomenon.

This therefore appears to affect the current hopes of producing a future generation with the required skills, innovation and creativeness. The study seeks to address and establish the factors that affect the integration and use of ICTs in secondary schools in Matungulu Sub-County, Machakos County.

### **1.3 Purpose of the Study**

The purpose of this study was to establish the factors that influence the integration of ICT in secondary schools in Matungulu sub county, Machakos County.

### **1.4 Specific Objectives of the Study**

The study was guided by the following specific objectives.

- i. To determine the influence of infrastructure availability and accessibility on the integration of ICT in secondary schools
- ii. To assess how teachers' ICT competence influences the integration of ICT in secondary schools
- iii. To examine the influence of teacher's attitude on the integration of ICT in secondary schools
- iv. To evaluate the extent to which teachers' teaching experience influences integration of ICT in education in secondary schools.

### **1.5 Research Questions**

The study sought to answer the following research questions.

- i. In what ways does the availability and accessibility of infrastructure influence ICT integration in secondary schools in Matungulu sub-county, Machakos County?
- ii. To what extent does the level of teachers' ICT competence influence the integration of ICT in secondary schools in Matungulu sub-county, Machakos County?
- iii. What is the influence of teacher's attitude in the integration of ICT in teaching and learning in secondary schools in Matungulu sub-county, Machakos County?

- iv. To what extent does teachers' teaching experience affect ICT integration in secondary schools in Matungulu sub-county, Machakos County?

### **1.6 Significance of the Study**

The scholarly significance of this study relies upon the fact that this study is to supply information to members of the scholastic community concerning a gap in knowledge on aspects that affect ICT amalgamation in education in secondary schools. This is essential for assisting to ensure that decision making in education results in good practices and not practices that might violate children's rights and best interests.

ICT incorporation in learning and teaching in secondary schools is important since it may provide the entire education cycle with information regarding usage of ICT to teachers in secondary schools. This information may turn to be used to design ways through which ICT may be integrated in teaching in Kenyan secondary schools. The findings of the study might also aid policy makers to identify challenges of ICT integration amongst teachers and students, offer solutions for the same and develop a policy framework which may lead to total adoption and embracing ICT amongst secondary schools students and teachers.

### **1.7 Delimitation of the Study**

The delimitation of a study are those particulars that restrict the scope of inquiry (Mitchell, Wirt and Marshall, 1986). Scope of the study was limited geographically to secondary schools within Matungulu sub County in Machakos County. The study targeted secondary school teachers, school principals, students and support staff. The content in the study was limited to utilization of ICT in secondary schools. Time of the study was limited to four months.

### **1.8 Limitation of the Study**

Mitchell, Wirt and Marshall (1986) define limitations of the study as those features of design or methodology that arrange parameters on the use of interpretations of the outcomes of this study. The sample to be used for this study posed a limitation in the ability to generalize the findings of this study to all schools although it was the initial intentions to make generalizations. Different work settings and differences in how schools are managed in Kenya and the differences in the geographical regions further limited the potential to generalize the findings of the stud to a larger population of schools. Time and financial resources were the major constraints in the study. Hence this research was carried out at sampled public secondary schools in Matungulu Sub-County, Machakos County, Kenya.

### **1.9 Assumptions of the Study**

This study made the following assumptions

- i. Teachers and principals in sampled public secondary schools who participated in this study did so willingly.
- ii. ICT use by teachers could lead to increased ICT use by their students and vice versa
- iii. All factors not included in the study remained constant
- iv. All the respondents gave honest and sincere answers
- v. The sample chosen was a representative of the total population.

### **1.10 Definition of Significant Terms**

**ICT integration in Secondary Schools:** This refers to the incorporation of technology in teaching and learning in Secondary Schools.

**Infrastructure availability and accessibility:** Availability postulates the presence of these ICT resources, accessibility means the level at which these ICT resources are conveniently accessible by many people as possible

**Teacher's attitude:** Refers to the teacher's prevailing tendency to react favourably or unfavourably to an object (person or group of people, institutions or events). Attitudes can be positive (values) or negative (prejudice).

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

**Teachers' ICT competence:** Refers to teachers and learners having knowledge, skills and support required to combine ICT in teaching and learning.

### **1.11 Organization of the Study**

This study is organized into five chapters namely; Introduction, Literature Review and Research Methodology. The introductory chapter serves to address the background information on the area of ICT amalgamation and identify the knowledge gaps are existence in this area of study. The Literature Review covers existing literature addressing to the study and has been organized as worldwide literature, regional literature and Kenya literature in context. The Chapter on Research Methodology outlines the target population, sampling design, and the data collection instruments that will be used to collect data.

Chapter four elucidates data analysis, presentation and interpretation of the study. Chapter five covers the summary of findings, discussions, conclusions and recommendations of the study.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

This particular study investigates the factors influencing ICT amalgamation in education among secondary schools that are public in Matungulu Sub-County, Machakos County of Kenya. The chapter reviews literature related to the conditions influencing integration of ICT in education among Kenyan public secondary schools. Because of the core aim of learning in this particular study, the chapter begins by discussing the most significant theories of learning from the past two centuries. It then considers the current models of interactive teaching applied in most school in order to combine ICT in the curriculum and thus eventually connect these theories and new notions to the utilization of ICT in Kenya secondary schools.

#### **2.2 ICT Integration in Teaching and Learning in Secondary Schools**

Information and communication technology (ICT) serves a pivotal part in the sector of education. ICT is considered to be a very important key in the unlocking of the skills and knowledge of our learners at all levels as well as a gateway for learning of the 21<sup>st</sup> century skills. Due to this realization, most governments in the world have put a lot of investment in equipping learning institutions with ICT equipment to enable teachers integrate ICT component in learning and teaching.

In the United States of America (USA), technological innovation in education started in the mid – 1800s with the introduction of related text books and moving through initial technologies such as film, radio, TV and computers (Kent and Mc Nergney 1999).



Application of computers at school level started earnestly in 1960s (Hanselbring, 1986). The initial national education technology plan “Getting America’s students ready for the 21<sup>st</sup> century: meeting the technological literacy challenge” was developed including four purposes for educational technology namely: giving all teachers in the country the required support and training in order to assist students support and training in order to assist students learn by use of computer all students and teachers were equipped with multi-media computers in their respective classes, every class to be linked to the information super highway therefore making effective software and online learning tools mandatory part of all school’s curriculum. For the purpose of having a teaching and learning procedure or a system of education supported by technology, the presence of adequate infrastructure is important (Law et al., 2000). This suppose that it is quite challenging to focus on implementation of technology in support of learning unless schools are supplied with elementary technological infrastructure and facilities. According to the presentation during an international conference of “ICT for language learning” entitled Factors influencing Teachers Utilization of ICT in teaching language: a case study of Hanoi University, Vietnam, one major barrier of ICT integration is the absence of access to ICT training and equipment. Although availability of ICT resources could be a barrier to integration, even when these resources are available, maintenance of the computers could also pose a threat to integration. This is according to research carried out on Ontarrio schools Reid S. (2002).

To encourage the utilization of ICT resources and apparatus for teaching, initiatives have been availed worldwide, continentally and in individual countries that comprise of Global e-schools initiatives. The global e-school and communities initiatives (Gesci, 2009). The

aim of this project is to exploit ICT resources to improve the standard of learning and teaching in primary and secondary of the developing countries (Gesci, 2012). Gesci involves the ministries of education (MOE) and other ministries in a country, to identify hinderances and explore the prospect of ICT (ibid). Their purpose is to assist authorities to spawn informed decisions with the concern to exploitation of educational ICT in schools (ibid). Through the Gesci, ICT facilities are not only deployed to schools but also incorporated into the school curricula (ibid). together with worldwide initiatives to ensure incorporating of ICT in schools there are also other practices (ICT deployment and incorporation in school curricula) within continental set ups.

In Africa, countries such as Nigeria, Senegal, Cameroon, Ghana, Mali, South Africa, Uganda, Namibia and Kenya, have had ICT in education initiatives that were driven mostly by educational institutions (like primary and secondary schools) (Farrell et al., 2007). In these countries the application of ICT in schools has been made possible by giant organizational programs like the world bank's links for development and school net Africa. ICT is viewed as an appliance for attaining educational results (LaRocque & Lathan, 2003). With the progress that ICT has to provide for the learning and teaching exercises, it is essential that every learner has ingress to ICT resources, for them to exploit its maximum gains. To this goal, most African countries (e.g. Zambia, Namibia, South Africa, Kenya, Ghana and Botswana) have come up with programs like e-schools initiative to boost worldwide ingress and use of ICT in all schools (NEPAD, 2010).

East African Nations suffer insufficiency of technological infrastructure. These infrastructures comprise: software, hardware, restricted internet ingress, low bandwidth

and sporadic electricity. Low teacher involvement in curriculum development and assessment, absence of in-service and pre-service teacher training, brain drain of teachers to western countries, poor welfare for teachers and lack of motivation present difficulties to ICT application in schools. Community and parent involvement in schools, poor vision, mission and leadership in most schools obstruct ICT integration in schools (Onguka & Obstruct, 2010). Gachinu (2014) posit that amalgamation of ICT in mathematics teaching is restricted absence of ICT facilities in schools and better performance in attainment test was noticed in Kenyan schools that have incorporated the component.

The survey further states that whilst internet speeds have been accelerated, costs have remained exorbitant for average Kenyans. The report reveals that 58 percent of Kenyans lack internet connectivity due to lack of computers. Whilst 28 percent who possess computers quote the high cost of internet subscription as a bottleneck. Although there is low number of connections in Kenya, internet usage in the country is high indicating that most connections are shared and largely compromise businesses which includes public accessible connections such as Cyber café and educational institutions. According to a survey dubbed “Julisha”, 80 percent of the interviewee said that they use mobile phones or internet enabled mobile phones for accessing the internet, proceeded by 71 percent using desktop computers, 34 percent use laptops and another 15 percent use smart phones. Meanwhile most ISPs in Kenya provide one just above 256 kbps or just about there, one has to take into consideration other aspects like cost and consistency to ensure he/she get a convenient deal (CCK, 2012). Table 2 shows the internet service providers in Kenya.

**Table 2.1: Internet Service Providers in Kenya and their Speeds**

<b>ISPS IN KENYA</b>	<b>ADVERTISED SPEED</b>	<b>ACTUAL SPEED</b>
Zuku Wananchi Online	8Mbps	1.97Mbps
Safaricom 3G	7.2 Mbps	0.68-3 Mbps
Safaricom EDGE/GPRS	3.6 Mbps	0.15-3.5 Mbps
Access Kenya	1.3 Mbps	0.3-1.3 Mbps
Kenya Data Networks	8 Mbps	0.09-1.25 Mbps
Airtel	3.75 Mbps	0.09-1.25 Mbps
Orange 3G	21.1 Mbps	Not available
Orange 3G+	31.7 Mbps	Not available

**Source: CCK, (2012)**

Kenya just like other developing countries strives with high degrees of poverty and this has a negative impact on the adoption and ingress to ICT (OECD, 2004). The first aim for introduction of ICTs in education was mainly to develop ICT skills, the focus over time has changed to leverage ICTs to address matters of quality and to improve learning and teaching particularly at secondary and post-secondary stages. Therefore, availability and utilization of ICTs, at different stages is still patchy. Approximately 1,300 secondary schools out of more than 6,000 schools have computers, whilst majority of the schools with computers utilize less than 40% of the infrastructure available and only a few apply ICT as a substitute means for curriculum delivery. This depicts quite slow amalgamation speed and may result to all gains of ICT in schools un-equitably realized or not being realized in the future. Majority of teachers perceive that adoption of ICT in school will push them out of employment due to its unpredictable gains like e-learning and efficiency in the mode of delivery (Kenya ICT policy, 2007). It is in this perception that the study is meant to investigate how the availability and accessibility of ICT facilities influences merging of ICT in public secondary schools teaching and learning.

### **2.3 Infrastructure and ICT Integration**

Infrastructure refers to computer peripherals, equipment and facilitates that are important for integration of ICT. Hadad and Draxler (2002) established that inadequate numbers of computer and limited funds deter schools and teachers from computer usage for learning and teaching. According to Draxler (2002) inadequate number of computers and ICT associated peripherals prevent schools in the usage of computers for teaching and learning. Access and lack of technological resources can adversely restrict what teachers can do in the classes with concern to integration of ICT (Muntaz, 2000). Menda (2006) reiterate that absence of software, internet restrict persons and community at large in accessing ICT and present a hinderance to its integration with curricula in schools. Farell (2007) established that Africa region particularly rural areas encounter systematic conditions such as electricity network configuration, regular power outages that raise ICT infrastructure costs rendering its integration and access difficult in these rural set-ups for learning and teaching practices. According to research carried out on Ontarrio schools by Reid (2002), it was noted that Although availability of ICT resources could be a barrier to integration, even when these resources are available, maintenance of the computers could also pose a threat to integration. For one to achieve a teaching and learning activity or system of education supported by emerging technology, the presence of satisfactory infrastructure is crucial (Law *et al.*, 2000).

### **2.4 Teachers ICT Competence and ICT Integration**

Hornby (2006) describes skill as the capability to perform tasks appropriately. Skills development in the study refer to unique potential (or expertise) enabling one to execute an exercise by the use of a computer efficiently together with its associated peripherals

for either learning and teaching. Dalton (1998) posits that training is focused towards changing people's experience, knowledge, skills and attitudes. Various studies have endeavoured to link adoption of ICT to teachers' ICT skills. For instance, while investigating the features obstructing teachers' readiness and confidence in ICTs applications, Telia et al. (2007) established that insufficient knowledge to assess the task of ICT in learning and teaching, absence of skills for using ICT software and equipment had caused lack of confidence in using ICT appliances. This is consistent with Preston (2000) who deduced that absence of technical backing to be major inhibitor of the utilization of ICT in the classroom.

According to Essay III (2010) on capacity building in education in the usage of ICT focuses on teacher training must be on sketch multimedia modules, borderless training strategy and furnishing pre-service and in-service teacher training with the aid of ICT-based resource packages tailored by teachers for those teachers under supervision and guidance. The purpose of this training program should be to bestow hands on ICT learning chance for teachers to become more agreeable with technology, absorbing the internet, webpage design, and project-based approaches to facilitate training. According to UNESCO (2011) teachers' development of ICT-pedagogy integration passes through four phases namely emerging (applying productivity instruments) applying intensifying traditional teaching methods), infusing (facilitating blended learning within or across subject areas), and altering (creating and managing ubiquitous and interactive e-learning platforms). This is because teachers need to become aware of ICT, learn how to employ ICT in subject teaching, familiarize on how and when to apply ICT and specialize in the usage/pattern of ICT.

Deficiency of ICT skills and knowledge by teachers can affect their competencies in incorporating their learning and teaching tasks. Newhose (2002) posits that most teachers devoid of skills and knowledge are not keen about combining ICT in their teaching pursuit. This renders it challenging for them to embrace it. Teachers without experience in computers don't want to try and work with them since they could look like imbecile and more stressed. Those teachers shy away entirely in combining ICT into their teaching and learning pursuits (Lam, 2000). Studies undertaken by Bill, Jesse and Acosta (2001) in Silicon Valley in America stipulate that less than 10% of the teachers utilize computers in their classrooms and most of them shy off due to lack of skills.

## **2.5 Teachers Attitude and ICT Combination in Teaching and Learning in Secondary Schools**

Van Braak *et al.* (2004) outlined the success and incorporation of ICT into classroom heavily relies on the teachers attitudes regarding ICT. Teachers whom are most likely to combine ICT instruments in classroom teaching and learning are those who have developed a positive perception towards technology application. Demirci (2009) undertook a study on teachers' attitudes towards utilization of geographic information systems (GIS) by teachers of geography in Turkey and revealed that despite impediments such as absence of software and hardware was witnessed, teacher's positive attitudes in embracing GIS was an essential determination to the successful incorporation of GIS into geography sessions.

In a related study, Teo (2008) teachers were positive on their attitude in view of computers and intent to use computer than their perceptions of the usefulness of the

computer and control of the computer. Drent and Meelissen (2008), also undertook a study on the features that influence the innovative application of ICT by teachers educators in the Netherlands on the disclosed and student-oriented pedagogical system, positive perception on computers, computer experience, and personal entrepreneurship of the teacher educator have a straight positive impact on the innovative utilization of ICT by the teachers.

Teachers' personal beliefs on education also impact on how ICT is combined in teaching and learning. Research (Ertmer, 2005) and Becker (2001) established that teachers who use the conventional teacher led teaching methods are not likely to incorporate use of computers in classroom teaching in comparison to those teachers who use learner-centred teaching methods that are used determines the extent of incorporation of ICT in teaching and learning. Teachers with equally powerful constructivist beliefs who equally have strong traditional beliefs utilize ICT more regularly (Tondeur et al., 2008). These studies propose that the potential of technology for classroom teaching and learning is enhanced by teachers who believe in student-centered methodologies which favours learning through discovery (Ertmer, 2005).

Research studies has exhibited that effective use of computers is reliant on the teachers' intentions, individual beliefs and teacher attitude on technology and ICT application (Divaharan and Ping, 2010; Ozden, 2007). Teachers perception on technology substantially influences their acceptance of the usefulness of technology and its incorporation in teaching. Buabeng-Andoh (2012) posits that the experience teachers possess in computers, the higher chances that they will exhibit positive attitudes towards



these computers. Most teachers have seen to resist the change concerning technology intervention, technology incorporation and technology alignment (Albirini, 2007).

Several studies divulge that a sizeable number of teacher hold negative perceptions towards implementation hence merging of ICT in schools. These attitudes vary from computer avoidance, anxiety, self-efficiency, enthusiasm, confidence, preferences and importance of computers towards individuals and social well-being (Manduku et al., 2012; Makhanu, 2010; Lau and Sim, 2008; Jimoy-Iannis and Komis, 2007). Gender, age, training, ingress to a computer, period of computer usage and ownership are also viewed as some of the variables used to assess teachers attitude towards merging of ICT. In a study, undertaken by Bakr (2011) on attitude of teachers of English in Syrian high schools towards ICT, he investigated the connection between computer and five independent variables: computer attributes, cultural perceptions, computer competence, computer access and personal characteristics including computer training background. The findings recommended that the teachers had positive attitude towards ICT in education and their attitudes were speculated by the mentioned five independent variables.

Individual characteristics like educational level, age, gender, educational experience, experience with computers for educational goal and attitude towards computers can influence the adoption of a technology Buabeng-Andoh (2012). The attitudes of teachers towards ICT highly influence their appropriation and integration. Teachers' attitudes and beliefs toward technology are amongst the factors that influence victorious integration of ICT into teaching (Hew & Brush, 2007; Keengwe & Onchwam, 2008). If teachers'

attitudes are positive towards the utilization of educational technology then they can easily give gainful insight about the embracing and incorporation of ICT into teaching and learning procedures. Negative attitudes towards technology on the other hand among teachers is a major snag to successful integration. It hasn't been confirmed whether attitude of teachers influences integration of ICT in learning and teaching in secondary schools in Matungulu sub-county. The study will seek to determine this assertion.

## **2.6 Teaching Experience and ICT Integration in Teaching and Learning**

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), contend that the experience of teachers has a substantial influence on embracement and utilization of technology in daily classroom affairs. An experience in teaching plays an important role for successful incorporation of ICT in the 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 application of ICT tools in classroom activities. The adoption and employment of ICT in teaching and learning is easily influenced by a period of time in which 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 who have considered computer experience had exceptional confidence in their capability to utilize more effectively.

In a study to assess integration of ICT in command 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 consolidation of ICT in learning and teaching. This indicates that the gap connecting the highly experienced versus the less experienced teachers has been determined by 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 ICT application 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 utilization in teaching and learning than recent-career teachers.

Mulwa and Kimosop (2015) established that the period of service of teachers in the profession influences the utilization of ICT in daily classroom activities. The teachers with a range of 1-5 years of experience in teaching have remarkable readiness to adopt and use ICT in teaching contrary to teachers with more years of experience but devoid of interests and skills in technology. However, Onwuagboke, Singh and Ngozika (2014) posited that the duration of teaching experience of a teacher has a direct relationship with ICT application in teaching. This entails the fact that the better experienced the teachers are, the more they readily use technology in teaching and learning processes. As quoted in Onwuagboke et al. (2014), a study by Rahimi and Yadollahi (2011) established no connection between ICT integration and teachers' years of teaching experience.

## **2.7 Theoretical Framework**

The study was steered by the Education Production Function theory. Coleman, (1966) suggested the theory of education production purpose as an application of the economic concept of a production function to the field of education. It associated with several inputs affecting a student's learning such as schools, families, peers and neighbourhoods to meted outputs comprising successive labour market success, college attendance, graduation rates, and, most constantly, standardized test scores. The theory of education production function was applied in this study to manifest how the diverse inputs in education by the government influence teachers' involvement in the incorporation of ICT in public secondary schools in Matungulu Sub County. Teachers' competency in ICT, their propensity in applying ICT in teaching and the availability of ICT facilities were considered to be the inputs in ICT integration in schools. The allocation of such inputs in public secondary schools would yield to improved ICT incorporation in teaching and learning.

Robinson, (1953) criticized the way the facet input capital in the education production function theory was measured and how the idea of factor portions had distracted economists. It is assumed that all workers are similar and their work output is the same. According to this argument, it is unbearable to conceive of capital in such a manner that its quantity is independent of the rates of interest and wages. Education production function theory therefore was applied in this study to determine the influence of teacher competencies in the integration of ICT, evaluate the range of ICT usage in teaching and learning, to ascertain how the availability of ICT facilities influence teachers' participation in ICT amalgamation in teaching and learning. The theory was also

deployed to establish the statistical relationship between teacher ICT competency and the integration of ICT in teaching and to decide the statistical relationship between teacher gender and the integration of ICT in teaching and learning in public secondary schools in Matungulu Sub County.

## **2.8 Conceptual Framework**

A conceptual framework is a written or visual presentation that describes either graphically, or in narrative form, the major variables under study. It indicates the crucial, aspects or variables and the believed relationship among them (Miles and Huberman, 1994). It refers to when the researcher conceptualizes the relationship between variables in the study and exhibits the connection graphically or diagrammatically. The conceptual framework in (Figure 1) conveys the factors (independent variables) that influence integration of Information and Communication Technology (ICTs) into teaching and learning process in Public Secondary Schools. The figure also shows other variables which may affect the connection between the independent variables and dependent variables (extraneous variables and intervening variables).

### Independent variables

- Infrastructure**
- Availability of space
  - Computers
  - Computer hardware
  - Source of power, projectors, internet service
  - Maintenance services

- Teachers ICT competencies.**
- Proficiency in ICT
  - ICT elementary skills
  - Media literacy
  - Social networking

- Attitude**
- Teacher's Attitude
  - Teachers' pedagogical beliefs
  - Willingness to use ICT
  - Positive attitudes
  - Negative attitudes

- Experience**
- Teacher's experience
  - Teachers' age
  - Length of use of ICT tools
  - Type of ICT tools used

### Moderating variables

- Government regulations
- Technological innovations
- Economic changes
- Government funding
- School Administration Support
- Competition
- Global scenarios

### Dependent variable

- ICT integration**
- Type of ICTs used
  - Frequency of use of ICTs
  - Courses taught using ICTs
  - Student's use of ICTs

- Age of the teacher
- Gender of teacher/student

### Intervening variable

Figure 1 Conceptual Framework

## **2.9 Explanation of Relationships**

The above conceptual framework represents on one end, the independent research variables hypothesized to be factors affecting the integration of ICT into classroom teaching and learning process and the integration of ICT in teaching as the dependent variable of this study.

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

and integration of ICT into the curriculum. School leadership refers to principal's strategic leadership of the school to deliver ICT integration in teaching and learning process.

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.

## 2.10 Research Gaps

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

<b>Author</b>	<b>Title</b>	<b>Main finding</b>	<b>Gap</b>
Kent and Mc Nergney	Will technology really change education: From Black board to Web? Thousand Dask, CA: Corwin Press.	Computer based education is an ability of making students gain knowledge, skill and behaviours which are related to use and usage of computers as a technological tool in the class by instructors	Use of computers as a technological tool in teaching and learning is not linked to the teachers competence in the use of the ICT tools
Law <i>et al</i>	Changing Classrooms & Changing Schools: a study of good practices in using ICT in Hong Kong schools. Hong Kong: CITE	Briefly described ways in which IT could be used in learning activities. He gave Examples of 'good practice' in Hong Kong schools	Specific IT tools such as computer packages were not described and stated as part of these tools
Reid, Scott.	The integration of information and communication technology into	Although availability of ICT resources could be a barrier to	ICT infrastructure maintenance could also pose a threat to Integration



	classroom teaching	integration, even when these resources are available, maintenance of the computers could also pose a threat to integration.	
Farrel, Glen.	Survey of ICT and Education in Africa: Kenya Country Report.	Across the continent, countries such as South Africa, Senegal, Mali, Ghana, Nigeria, Cameroon, Namibia, Uganda and Kenya, have had ICT in education initiatives that were driven mainly by educational institutions (such as primary and secondary schools)	The ICT in education initiatives have been in existence for some time in different countries but have been driven by the institutions themselves not the government or the ministry of education
LaRocque & Latham	The Promise of E-Learning in Africa: the Potential for Public-Private Partnerships.	ICT is seen as a tool for achieving educational outcomes	Challenges of ICT integration in teaching and learning hasn't been discussed
Hadad & Draxler	Technologies of Education Washington D.C/ Paris: UNESCO and the Academy for Education Development	Insufficient numbers of computers and insufficient funds prevent schools and teachers from using computers for teaching and learning	The ratio of computers to students hasn't been addressed
Menda	ICT in education: content issues as Kiswahili reigns; connect-online: Applying knowledge to development	Lack of software, internet limit individual and community access to ICT and pose a barrier to its integration with curricula in schools	ICT infrastructure and integration in teaching and learning in relation to pedagogy

Hornby	Definition of skill	Defined skill as the ability to do something well. Skills development in this study refer to special ability (or expertise) enabling one to perform an activity by using a computer efficiently and its related peripherals in either teaching or learning	Needs to link skill development and competence development
UNESCO	ICT Competency Framework for Teachers (ICT-CFT) and Institution's Strategy for Teacher Training on ICT-pedagogy Integration	Teachers' development on ICT-pedagogy integration goes through four stages namely emerging (applying productivity tools) applying (enhancing traditional teaching), Infusing (facilitating blended learning within or across subject areas), and Transforming (Creating & managing ubiquitous & interactive e-learning environments). This is because teachers need to become aware of ICT, learn how to use ICT in subject teaching, understand how and when to use ICT and specialize in the use/design of ICT	Key Strategies for Teacher Training on ICT-pedagogy Integration
Demirci	How do Teachers Approach New	Teachers' attitudes towards the use of	Teachers attitudes and adoption of new

	Technologies: Geography Teachers' Attitudes towards Geographic Information Systems (GIS).	geographic information systems (GIS) by geography teachers in Turkey and revealed that though barriers such as lack of hardware and software existed, teacher's positive attitudes towards GIS was an important determinant to the successful integration of GIS into geography lessons	technologies in teaching and learning
Hew & Brush; Keengwe & Onchwam	Integrating Technology into K- 12 teaching and learning: current knowledge gaps and recommendations for future research	Teachers' attitudes and beliefs toward technology are among the factors that influence successful integration of ICT into teaching	Barriers to successful implementation of ICT in teaching and learning
Chemwei, Njagi and Koech	Assessment of Information and Communication Technology (ICT) integration in instruction in teacher education	The experience of teachers has a considerable influence on adoption and use of technology in daily classroom activities	The impacts of teaching experience in adoption of ICT in teaching and learning in secondary schools
Deen-Swarray, Gillwald, and Morrell	Lifting the veil on ICT gender indicators in Africa.	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 number of years one has been teaching and its effect to adoption of ICT in teaching and learning in secondary schools
Mulwa and Kimosop	The Influence of Principals', Teachers' and Students' attitude on Readiness to Integrate e-Learning	The length of service of teachers in teaching profession influences the use of ICT in daily	Teaching Experience and ICT Integration in Teaching and Learning

	in Secondary Schools in Kitui District, Kenya	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	
Onwuagboke, Singh and Ngozika	Availability, Gender and Teaching Experience: Determinants of ICT Utilization in Teaching in Rural Secondary Schools in South Eastern Nigeria	The number of years of teaching experience of a teacher has a direct relationship with use of ICT in teaching	Teachers' Teaching Experience and ICT Integration in Teaching and Learning
Rahimi and Yadollahi	Computer Anxiety and ICT integration in English classes among Iranian EFL teachers	No connection between ICT integration and teachers' years of teaching experience	Relationship between ICT integration and teachers' years of teaching experience

From the above Table, it's clear that;

1. Research has not been undertaken to establish causes affecting ICT integration in schools that received funding from the Ministry of Education under Economic Stimulus Programme (ESP) project.
2. Little research is available on ICT integration in Kenya secondary schools in Matungulu Sub-county, Machakos County. Most of research has been conducted in schools in other counties in Kenya and developed countries.

## **2.11 Summary of Literature**

This chapter has given an highlight of the literature associated to the study. Both literature reviewed from the studies done locally and internationally have highlighted some of the matters particularly to integration of ICTs in education for example adoption of ICTs by educational managers, challenges and assessment.

The literature was arranged thematically according to the aims and questions of the study.

The literature review has indicated that:

- i. Integration of ICTs in all spheres of life is well documented and reflected in education in general and broadly and does not clearly articulate the combination of computer aided learning in education and especially the level and nature of integration.
- ii. The reviewed literature is in developed countries with well-developed ICTs infrastructure in place like United States of America, China, and Canada amongst others and is on higher learning institutions. However, literature review hardly provides information on ICTs adoption in developing countries and especially in secondary schools
- iii. The literature reviewed shows that there exist theories and models on ICTs adoption that have been used in several studies. Little has been done using the Education Production theory that this study is articulating.
- iv. The literature reviewed has also shown that many studies done on integration of ICTs in teaching and learning is in the areas of Science, Mathematics and computer based subjects.

Though some schools are careful of not to introduce too many ICT teaching in the process, this study aimed to prove that embedding ICT into the teaching and learning process is quite essential. While there has been some innovation in pedagogical strategy, including notable successes through the use of ICT, most secondary schools still have a long way to go because an old teacher-centred paradigm still exists in schools the world over, as opposed to more modern ways which address student-centred principles.

In the literature review, the study considered the areas most crucial to the four research questions already specified, and considered the role of ICT in interactive teaching, the connection between several learning theories and ICT and thereafter the utilization of ICT by respective subjects, universally and studies which have examined the part of teachers in ascertaining ICT application.

## **CHAPTER THREE**

### **RESEARCH METHODOLOGY**

#### **3.1 Introduction**

This chapter describes the research methods selected for this study and explains the rationale for selecting these methods. Details of the process to be employed to collect the data and procedures followed to ensure data collection was valid are explained.

#### **3.2 Research Design**

A research design is the arrangement of conditions for collection and analysis of data in a way that aims at minimizing expenditure of efforts, time and money (Kombo and Tromp, 2006). Orodho (2005) notes that the research design employed depends on what the researcher is trying to investigate. In the study, descriptive survey was used. Descriptive survey is a method of collecting information by interviewing or administering a questionnaire to a sample of individuals (Orodho, 2003). It involves extensive observation, note taking and in-depth narrative to describe, explain and interpret conditions as they are (Kothari, 2003). This design is suitable for this study because it enabled respondents to give their opinions in relation to the application of ICT integration in teaching and learning (Kombo & Tromp, 2006). The descriptive design enables the researcher to construct questions that can solicit the desired information and also identify suitable participants for the study.

#### **3.3 Target Population**

The target population of this study comprised of teachers of public secondary schools in Matungulu Sub-County. A study target population is the totality of person, events,

organizations, units or other sampling units which address the research problem (Mohlokane, 2004). Mugenda and Mugenda (1999), defines a population as a complete set of individuals, cases or objects with some common observable features. A target population is that population to which a researcher intends to generalize the outcomes of a study. The target population was all the eleven public secondary schools under the Economic Stimulus Programme (ESP) programme in Matungulu Sub County. The study targeted all the teachers teaching in every of the eleven schools. Eleven principals and all the students were involved in the study.

The total population for the study was therefore 4912 respondents as shown on Table 3.1.

**Table 3.1: Target Population**

<b>Schools</b>	<b>Principal</b>	<b>Teachers</b>	<b>students</b>	<b>Support staff</b>
Itheuni Secondary School	1	8	205	2
Fr. Heeran Girls High School	1	26	500	2
Katulye Secondary School	1	15	252	2
Kinyui Boys High School	1	21	455	2
Katheka Secondary School	1	9	223	2
Kinyui Girls High School	1	28	574	2
S.A Nguluni Secondary School	1	16	271	2
Sengani Girls Sec. School	1	37	700	2
St. Josephs Kikuyuni Secondary School	1	6	225	2
Tala Boys High School	1	40	760	2
Tala Girls High School	1	38	546	2
<b>Total</b>	<b>11</b>	<b>168</b>	<b>4711</b>	<b>22</b>

**Source:** Matungulu Sub-County Education Office, 2018



### 3.4 Sample Size and Sampling Procedure

The size of the sample used in this study and the procedure for obtaining the sample are given in this section.

#### 3.4.1 Sample Size

A sample size is the number of observations used for calculating estimates of a particular population. This study used a sample of 343 respondents whose distribution is shown in the sampling frame (Table 3). The sample size has been derived from the Krejcie and Morgan Table (Appendix VIII).

**Table 3.2 Sampling Frame**

<b>Category</b>	<b>Target Population</b>	<b>Sample size</b>
Principals	11	1
Teachers	168	12
Support staff	22	2
Students	4711	328
<b>Total</b>	<b>4912</b>	<b>343</b>

#### 3.4.2 Sampling Procedure

Sampling is the process of selecting a number of individuals for a study in such a manner that the selected individual represents the large group from which they were selected. Simple random sampling and purposeful sampling techniques were applied in the study to obtain a sample from the target population. As shown in Table 3, only one (1) principal participated in the study. The principal was picked using simple random sampling. The rest of the respondents were only picked (at random) from the schools whose principals have been picked. Three hundred and twenty eight (328) students were used in this study. Simple random sampling was also used to select two (2) support staff and twelve (12) teachers for the study. Kerlinger (1970) suggests that 30% of a sample population is appropriate for the purpose of research.

### **3.5 Data Collection Instrument**

The data collection instruments applied in the study were designed and developed by the researcher. The study used questionnaires for teachers and students and interview schedule for principals and support staff. A questionnaire is a collection of elements to which a respondent is expected to react in writing. The questionnaire has been structured in such a manner that the respondents were expected to answer all the questions that aid in meeting the research objectives. The teachers' questionnaire, which is the main appliance for the research was divided into five sections namely: background information, teachers' view on ICT integration, teachers' capacity development in use of ICT apparatus, utilization of ICT in teaching subjects and management support for teachers in ICT. The items were rated on a 4-point Likert scale. The students' questionnaire has two sections: Background information, expertise in computer use, use of ICT in class by teachers and uses of computers by students.

The study also employed the use of interview schedule as a way of gathering data. Face to face interviews with the 1 principal and 2 support staff was carried out. Structured and semi- structured interview questions were used. The reason for use of interviews is that they are convenient to administer since the questions are prepared in advance. They also permit a large deal of information to be gathered in a short span of time. Interviews also aid in seeking clarity through probing. The questions that were to be posed were confidential between the researcher and the respondents.

### **3.5.1 Pilot Testing of the Instruments**

It is essential to pilot all questionnaires to ascertain the amount of time needed for successful completion (Bell, 1999). Oppenheim (1992) cited in Cohen *et al.* (2007) describes the function of a pilot is to improve reliability, validity and practicability of the research instrument by clarifying, checking validity of questions, eliminating ambiguities, checking readability, gaining feedback, identify omissions, checking completion time, identify redundant questions and to identify any misconstrued questions. The questionnaire and interview questions were piloted with thirty six (36) respondents prior to conducting the research. Thirty four (34) students, one (1) teacher and one (1) support staff were used in the pilot.

### **3.5.2 Validity of the Instrument**

Validity of a research tool is the extent by which a research tool 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 few schools. The outcomes were used to arrive at valuable judgement particularly on content validity to ensure that it is 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 were validated by consulting the supervisor 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.

The questionnaire's content and face validity were confirmed as follows:

- i. The literature review: the study's questionnaire was an extended version of another tested and used questionnaire from another study. This questionnaire was selected from amongst other questionnaires after search of the available literature and confirmed to have a high level of internal validity.
- ii. Clarity of the phrase and integrity of its formulation.
- iii. Appropriate phrase axis to which it belongs.
- iv. Proposals to amend, addition or deletion.
- v. The final version of the questionnaire was produced and implemented in the study.

The content validity was applied to measure the level of accuracy in the data collected by use of questionnaires. To enhance the validity of the questionnaires and interview schedules, piloting was carried out in one school with 5 teachers, 20 students, 1 support staff and 1 principal filling in the questionnaire. The researcher administered the questionnaires to ensure that all elements are clear. This ensured that there was no misinterpretation of items when administered to the respondents in the main study. The following formula was used to calculate content validity index.

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

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

### **3.5.3 Reliability of the Instrument**

Internal consistency reliability were done which is a measure of reliability used to assess the level in which different test items that probe the same construct produce same results. Split-half reliability test was used. This means splitting in half all elements of the test in every section in order to form two “sets” of items. The entire test was administered to the pilot group. The total aggregate score for each “set” was computed, and eventually the split-half reliability got by determining the correlation between the two total set scores.

Reliability is a concept that depicts how well the different items in a single dimension merge to measure the same thing. Alpha (Cronbach) coefficients were calculated for the parts of each measurement scale to verify internal consistency. Reliability was improved through the use of a same environment for conducting the interviews and maintenance of a similar tone and expression by the interviewer.

### **3.6. Methods of Data Collection**

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

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

The researcher secured a letter from University of Nairobi (UON). The letter from UON was used to get a research permit from the National Council for Science, Technology and Innovation (NACOSTI). A letter of introduction was written to the principals of the

sampled public secondary schools. The researcher visited the schools on appointments and personally administered the questionnaires. Approval by the principals and cooperation of members of the teaching staff was sought. The researcher further assured the principals and teachers that the findings were only to be used to accomplish the study and confidentiality was guaranteed.

### **3.7 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 was 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 categorized and organized in accordance with the objectives of the study for analysis applying Statistical Package for Social Sciences (SPSS), version 21. A qualitative data collected from interview schedule was analyzed, interpreted and presented descriptively. Then data entry began including sorting, encoding and interpreting into meaning in reference to the objectives of the study as organized in the questionnaire. The analyzed data was interpreted and presented on bar graphs, pie charts and tables to enhance efficiency of the study (Cohen et al. 2007).

### **3.8 Ethical Considerations**

The Oxford Advanced Learner's Dictionary (8<sup>th</sup> Edition) describes the word ethical as something morally correct or acceptable. Johnson (2008) proposes that Ethics are “principles and guidelines that aid us uphold the things we value”. For researchers, ethics is an essential consideration and the researcher obtained a permission letter from the NACOSTI to be allowed in the schools and distribute questionnaires to students together with the teachers in addition to carrying out interviews with teachers. The value of research relies as much on its ethical veracity as on the novelty of its discoveries (Walliman, 2011). The researcher, with approval from participants, explained that their participation is voluntary and statements were to be kept confidential and that the information was only for research use and the researcher didn't ask participants to mention their names in order to preserve their privacy. Likewise objectives of the study were explained. The researcher followed these instructions in compliance with Ethical clearance at the School of Continuing and Distance Education at the University of Nairobi.

### **3.9 Operational Definition of Variables**

Operationalization table shows the various variables in the study which were investigated. The variables were independent variables, ‘factors influencing ICT integration in teaching and learning’ and dependent variable, ‘levels of ICT integration in teaching and learning’. The operationalization of variables is given in Table 3.3

**Table 3.3: Operationalization of Variables**

Objectives	Variable	Indicators	Measurement	Measurement Scale	Tool of Analysis	Type of analysis
To determine the influence of infrastructure availability and accessibility on the integration of ICT in secondary schools	Independent	-No. of computers No. of projectors -Hardware devices Connectivity to the Internet	-Number of computers ready for use -Connectivity to the Internet by modems	Nominal	Frequency, percentage	Descriptive
To assess how teachers' ICT competence influences the integration of ICT in secondary schools	Independent	-Certification in ICT. -Number of Staff Trained in ICT and Level of ICT. - Presence of training Forums.	-Professional certification -Number of ICT trained personnel  -Professional Training on ICT	Nominal  Ordinal/ Interval  Nominal	Frequency, percentage   Frequency, percentage	Descriptive   Descriptive
To examine the influence of teacher's attitude on the integration of ICT in secondary schools	Independent	opinions as rated on likert scale	Level of ICT uptake No. of students taking computer studies	Nominal  Ordinal/ Interval	Means independent samples t-test ANOVA	Descriptive
To evaluate the extent to which teachers' teaching experience affects integration of ICT in education in secondary schools.	Independent	Basic Operations on computers.  Use of ICT tools in search of new knowledge, solving complex mathematical problems etc.	Academic and Professional Qualification  Training in ICT	Nominal  Nominal	Frequency percentage  Frequency percentage	Descriptive  Descriptive
	Dependent	Use of Technological Tools Application of technology in problem solving and search for new knowledge	Use of basic application software Numerical analysis, word processing	Nominal  Ordinal	Frequency Percentage  Frequency Percentage	Descriptive  Descriptive



## CHAPTER FOUR

### DATA PRESENTATION, ANALYSIS AND INTERPRETATIONS

#### 4.1 Introduction

This chapter presents analysis of the data on the influence of the integration of ICT in secondary schools in Matungulu sub county, Machakos County. The chapter also entails findings and results of the study and discussion on findings and outcomes versus the literature reviewed and study objectives stated in chapter one.

#### 4.2 Response Rate

The response rate was considered very good and adequate for the study as shown in the Table 4.1.

**Table 4.1: Distribution of the Respondents by Responses Rate**

Response Rate	Frequency	Percentage
Students	328	100.0
Teachers	12	100.0
Support staff	2	100.0
Principals	1	100.0

Out of 343 questionnaires which had been administered to the respondents in all four categories, all of them were returned for analysis with no missing feedback. This translates to 100.0% return rate of the respondents. According to (Mugenda, 2003) a response rate of 50% is sufficient for analysis and reporting; a rate of 60% is ideal and a response rate of 70% and over is commendable; therefore, this response rate was appropriate for analysis and reporting since it was above 70%.

All the responses were considered valid and analysed. This represented 100% response rate.

### 4.3 Demographic Information

The respondents in this section of the study were students, teachers, support staff and principals from Matungulu sub county, Machakos County who were of different categories. The categories were characterized by gender, age and level of education.

#### 4.3.1 Gender of Respondent

The respondents were requested to specify their gender and their responses are recorded in Table 4.2

**Table 4.2: Distribution of Respondents by Gender**

	Frequency	Percent	Cumulative Percent
Male	189	57.6	57.6
Female	139	42.4	100.0
Total	328	100.0	

According to the data shown in Table 4.2, out of 328 students who took part in the study, (57.6%) consisted of males and (42.4%) were female. The findings could be an indication that most of the students in Matungulu Sub County were males.

#### 4.3.2 Students' Level (Class) in School

The student respondents who participated in the study were from different classes as depicted in Table 4.3

**Table 4.3: Class of study of respondents**

	Frequency	Percent	Cumulative Percent
Form 1	79	24.1	24.1
Form 2	64	19.5	43.6
Form 3	100	30.5	74.1
Form 4	85	25.9	100
Total	328	100.0	

The results in Table 4.3 indicate that great number of the students involved in the study were in form 3 (30.5%), 25.9% in form 4, 24.1% in form 1 and 19.5% in form two. This indicated uniform distribution of students from all classes for the study.

### 4.3.3 Age of Respondents

The ages of the respondents involved in the study are illustrated in Table 4.4.

**Table 4.4: Age of Respondent**

	Frequency	Percent	Cumulative Percent
Below 14 years	10	3.0	3.0
15 years	55	16.8	19.8
16 years	71	21.6	41.5
17 years	70	21.3	62.8
Above 17 years	122	37.2	100.0
Total	328	100.0	

It is clear from the data shown in Table 4.4 that, most of the students (37.2%) were aged above 17 years, while (21.6%) were aged 16 years, (21.3%) were aged 17 years, (16.8%) were aged 15 years and (3.0%) were below 14 years. The findings imply that majority of students in the study fall under the age above 17 years.

### 4.3.4 Educational Qualification

The study was conducted to a cross section of respondents with different academic qualifications. This information is summarized in Table 4.5.

**Table 4.5: Educational Qualification**

	Frequency	Percent	Cumulative Percent
Master Degree	1	8.3	8.3
B.Ed./BSc	10	83.3	91.7
Diploma	1	8.3	100.0
PhD	0	0.0	100.0
Others	0	0.0	100.0
Total	12	100.0	

According to the data in Table 4.5, most of the teachers in the study had B.Ed./BSc degree (83.3%), (8.3%) had master degree, (8.3%) were diploma holders and (0.0%) for PhD holders and others.

#### 4.4 Infrastructure and ICT Integration

The researcher strived to establish issues regarding availability and access to ICT infrastructure and their influence on ICT incorporation into teaching and learning. The following statements relating to ICT infrastructure adequacy and internet connection installation were provided to the respondents and were requested to present the extent to which they either concurred or disagreed with the statements. Table 4.7 shows the responses.

##### 4.4.1 Level of Expertise in Computer Use

The level of expertise in computer use is recorded in Table 4.6.

**Table 4.6: Level of Expertise in Computer Use**

	Frequency	%	Cumulative %
No expertise-cannot use computers at all	39	11.9	11.9
Fair-able to operate basic computer functions	100	30.5	42.4
Good	83	25.3	67.7
Very Good	49	14.9	82.6
Excellent	57	17.4	100.0
Total	328	100	

It is proved from the data shown in Table 10 the majority of respondents, their level of expertise in computer use were fairly able to operate computer (30.5%), (25.3%) were rated good to operate a computer, (17.4%) were excellent in operating, (14.9%) were rated very good in operating while those who had no expertise in operating a computer were least with (11.9%). This implies that many were conversant with use of ICT tools since only 11.9% out of 100% cannot operate a computer. The explanation to the findings is that, ICT can be merged in secondary schools in teaching and learning since many are able to operate computers comfortably.

#### 4.5 Computer Involvement in Teaching

Computer involvement in teaching and learning is listed in table 4.7.

**Table 4.7: Subject(s) where the Teacher Used Computers in the Last One Week**

	Frequency	Percent	Valid Percent	Cumulative Percent
English	48	14.6	14.6	14.6
Any foreign language	21	6.4	6.4	21.0
Kiswahili	31	9.5	9.5	30.5
Mathematics	10	3.0	3.0	33.5
Science	46	14.0	14.0	47.6
Computer studies	112	34.1	34.1	81.7
History	13	4.0	4.0	85.7
Geography	6	1.8	1.8	87.5
Agriculture	1	0.3	0.3	87.8
Religious education	8	2.4	2.4	90.2
Home science	1	0.3	0.3	90.5
Physical Education	31	9.5	9.5	100.0
Total	328	100.0	100.0	

The findings on Table 11 depict that majority of students said computer studies (34.1%) was the most involving in using computer, (14.6%) said English was most involving, (14.0%) said science, (9.5%) said Kiswahili and physical Education were most involving, (6.4%) were in the category of any foreign language, (4.0%) in History, (3.0%) said

Mathematics, (2.4%) gave Religious Education, (1.8%) were for Geography, and the least number only (0.3%) said Agriculture and Home science involved computer in teaching and learning. This concludes that every subject used computer in teaching and learning hence ICT instruments should be bought in abundance to ensure that there are enough equipment for teaching students.

#### 4.6 Computer Use in School

The respondents were urged to show the various ways they utilized computers in the course of teaching and learning. The findings were as shown on Table 4.8

**Table 4.8: Ways of Use Computers in School**

	Sometimes	Never
Browse for information on internet	199 (60.7%)	129 (39.3%)
Play games	166 (50.6%)	162 (49.4%)
Send email to other people	168 (51.2%)	160 (48.8%)
Do my homework	187 (57.0%)	141 (43.0%)
Download music	156 (47.6%)	172 (52.4%)
Write reports on project work	189 (57.6%)	139 (42.4%)
N = 328		

#### *Chi-Square Tests*

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	14.298 <sup>a</sup>	1	0.000
Likelihood Ratio	14.254	1	0.000
N of Valid Cases	328		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 59.75

### Symmetric Measures

		Value <sup>c</sup>	Approx. Sig.
Nominal by Nominal	Phi	0.475	0.000
	Cramer's V	0.475	0.000
N of Valid Cases		12	

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

The results in Table 4.8 indicate that, high number of students concurred that they used computers sometimes in various tasks in school, while a few stated that they never used computer in such occasions. (60.7%) said they used computers sometimes to browse for information while (39.3%) never used at all, (50.6%) used sometimes to play games with (49.4%) not playing games, (51.2%) said they used computers sometimes to communicate through sending email to others while (48.8%) never used. (57.0%) used computers sometimes to do homework with only (43.0%) not using computers to do homework. In downloading music only (47.6%) used computers sometimes and (52.4%) did not use to download music. To write projects and reports a higher number of students (57.6%) used computers sometimes and only (42.4%) of the students who didn't use computers in report and project writing.

The p-value shows that these variables are not independent of each other and that there is statistically recognizable relationship between the categorical variables. To conclude on that, the variables influence the integration of ICT in teaching and learning since they are statistically significant ( $p\text{-value} < 0.05$ ).

The Cramer's V which determines the strength of association between categorical variables, states that, 0.1 is small effect, 0.3 is medium effect and 0.5 is large effect. From the results, the Cramer's V value is 0.475 which is approximately 0.5 when rounded off, an indication that the factor has a large effect size in the study.

## 4.7 Teacher Competence and ICT Integration

The study sought to establish the extent of ICT competence of teachers. The responses from the teachers are discussed in the following section.

### 4.7.1 Teachers' competence in use of ICT tools

The findings of the teacher's competence in the use of ICT tools are recorded in Table

4.9

**Table 9: Teachers' competence in use of ICT tools**

Statement	Strongly agree	Agree	Disagree	Strongly disagree
Use of word processing in preparation of lessons and worksheets	0 (0.0%)	7 (58.3%)	4(33.3%)	1 (8.3%)
Use of spreadsheets in analysis of students marks	1 (8.3%)	7 (58.3%)	2 (16.7%)	2 (16.7%)
Use of databases in storage of students records	1 (8.3%)	6 (50.0%)	3 (25.0%)	1 (8.3%)
Use of Power point presentations for classroom instructions	1 (8.3%)	5 (41.7%)	6 (50.0%)	0 (0.0%)
Use of ICT in the classroom for instructional purposes	1 (8.3%)	9 (75.0%)	2 (16.7%)	0 (0.0%)
Use internet to access teaching and learning resources	3 (25.0%)	6 (50.0%)	2 (16.7%)	1 (8.3%)
How to operate and maintain computers	3 (25.0%)	5 (41.7%)	4 (33.3%)	0 (0.0%)
Assist students to access learning materials	2 (16.7%)	6 (50.0%)	4 (33.3%)	0 (0.0%)
Assess students learning	2 (16.7%)	6 (50.0%)	3 (25.0%)	1 (8.3%)
Collaborate with other teachers e.g. through use of blogs	3 (25.0%)	6 (50.0%)	1 (8.3%)	1 (8.3%)

N = 12

### Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	12.373 <sup>a</sup>	1	0.015
Likelihood Ratio	9.034	1	0.034
N of Valid Cases	12		

a. 2 cells (25.0%) have expected count less than 5. The minimum expected count is 2.97.



*Symmetric Measures*

		Value <sup>c</sup>	Approx. Sig.
Nominal by Nominal	Phi	0.600	0.015
	Cramer's V	0.600	0.015
N of Valid Cases		12	

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Majority (58.3%) of respondents were in agreement with the statement, use of word processing in preparation of lesson and worksheets, (33.3%) disagreed, (8.3%) strongly disagreed and (0.0%) strongly agreed to the statement. Only (8.3%) of respondents strongly agreed, (58.3%) agreed and (16.7%) disagreed and also strongly disagreed to the use of spreadsheets in analysis of students marks. (8.3%) of respondents strongly agreed and strongly disagreed to use of database in storage of students records, (50.0%) agreed while (25.0%) disagreed to the statement. (8.3%) of respondents strongly agreed, (41.7%) agreed, (50.0%) disagreed and (0.0%) strongly disagreed to use of power point presentations for classroom. Majority (41.7%) agreed to statement how to operate and maintain computers, (33.3%) disagreed, (16.7%) strongly agreed while (0.0%) strongly disagreed to the statement. (16.7%) strongly agreed, (50.0%) agreed, (33.3%) disagreed and (0.0%) strongly disagreed to the statement assist students to access learning materials. Approximately (16.7%) of respondents strongly agreed to the statement assess students learning, (50.0%) agreed, (25.0%) disagreed and (8.3%) strongly disagreed to the statement. Majority (50.0%) agreed, (25.0%) strongly agreed whilst (8.3%) disagreed and also strongly disagreed to the statement collaborate with other teachers.

The Cramer's V value is 0.600 which implies that, teachers' competence has a large effect size in the study. Also the p-value (0.015) is less than 0.05, this shows that the variables are not independent of each other and that there is statistically significant relationship between the variables indicating that teachers' competence in use of ICT instruments is a significant factor under the study.

#### **4.8 Respondent Attitude and ICT Integration**

The teachers' attitudes on ICT merging in teaching of English were measured using 18 items. The elements were positive statements which respondents were expected to rate using a rating scale as follows: Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD).

##### **4.8.1 Teachers' Attitudes on ICT integration**

The study sought to establish from the respondents whether ICT tools were difficult to use, they were comfortable using computers, whether ICT tools made them better teachers and if they used the ICT tools in teaching. The results were as presented in Table 4.10.

**Table 4.10: Teachers' attitudes on ICT incorporation**

Statement	Strongly agree	Agree	Disagree	Strongly disagree
ICT tools are difficult to use	0 (0.0%)	3 (25.0%)	8 (66.7%)	1 (8.3%)
I feel comfortable working with ICT tools like computer	3 (25.0%)	8 (66.7%)	1 (8.3%)	0 (0.0%)
I believe that I could be a better teacher with ICT tools	4 (33.3%)	8 (66.7%)	0 (0.0%)	0 (0.0%)
I see the ICT tools as sometimes I will rarely use in my teaching	1 (8.2%)	2 (16.7%)	7 (58.3%)	2 (16.7%)
Use of the ICT tools in teaching can improve students' performance	7 (58.3%)	5 (41.7%)	0 (0.0%)	0 (0.0%)
I think that using ICT tools for teaching would be enjoyable and stimulating	9 (75.0%)	3 (25.0%)	0 (0.0%)	0 (0.0%)
ICT tools are not relevant in teaching	0 (0.0%)	0 (0.0%)	3 (25.0%)	9 (75.0%)
I always try out some learning activities with ICT tools	0 (0.0%)	7 (58.3%)	5 (41.7%)	0 (0.0%)
I encourage my students to use ICT tools	1 (8.3%)	9 (75.0%)	2 (16.7%)	0 (0.0%)
I consider use of ICT tools as useful for learning	5 (41.7%)	7 (58.3%)	0 (0.0%)	0 (0.0%)
I do not feel threatened with the use of ICT tools	4 (33.3%)	7 (58.3%)	0 (0.0%)	1 (8.3%)
I plan for use of ICT tools in my lessons	1 (8.3%)	4 (33.3%)	7 (58.3%)	0 (0.0%)
Use of ICT tools is critical for improvement of learning achievement	4 (33.3%)	6 (50.0%)	2 (16.7%)	0 (0.0%)
I make efforts to upgrade my skills in use of ICT tools	3 (25.0%)	7 (58.3%)	2 (16.7%)	0 (0.0%)
I encourage my students to search for information on the internet	1 (8.3%)	10 (83.3%)	0 (0.0%)	1 (8.3%)
Use of ICT tools in class is very frustrating	0 (0.0%)	2 (16.7%)	4 (33.3%)	6 (50.0%)
I am incapable of operating ICT tools independently	1 (8.3%)	1 (8.3%)	6 (50.0%)	4 (33.3%)
I feel inadequate in using ICT tools in class	0 (0.0%)	1 (8.3%)	9 (75.0%)	2 (16.7%)

N = 12

**Chi-Square Tests**

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	0.114 <sup>a</sup>	1	0.073
Likelihood Ratio	0.105	1	0.086
N of Valid Cases	12		

a. 2 cells (25.0%) have expected count less than 5. The minimum expected count is 2.97.

*Symmetric Measures*

		Value <sup>c</sup>	Approx. Sig.
Nominal by Nominal	Phi	0.098	0.073
	Cramer's V	0.098	0.073
N of Valid Cases		12	

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

From the outcomes, (25.0%) of respondents agreed, (66.7%) disagreed, (8.3%) strongly disagreed and (0.0%) strongly agreed that ICT tools are difficult to use. (25.0%) strongly agreed, (66.7%) agreed, (8.3%) disagreed and (0.0%) strongly disagreed that working using ICT tools is comfortable. (33.3%) of respondents strongly agreed, (66.7%) agreed while (0.0%) disagreed and also strongly disagreed that they could be better teacher with ICT instruments. (8.2%) strongly

agreed, (16.7%) agreed, (58.3%) disagreed and (16.7%) strongly disagreed that they see ICT tools as sometimes they will rarely use in their teaching. (58.3%) strongly agreed, (41.7%) agreed and (0.0%) disagreed and also strongly disagreed that use of ICT tools in teaching can improve performance. (75.0%) strongly agreed, (25.0%) agreed and (0.0%) strongly disagreed and also disagreed using ICT tools for teaching would be enjoyable and stimulating. About (25.0%) and (75.0%) disagreed and strongly disagreed respectively while (0.0%) strongly disagreed and agreed that ICT tools are not relevant in teaching. Approximately (58.3%) agreed and (41.7%) disagreed while (0.0%) strongly disagreed and strongly agreed that they always try out some learning activities with ICT tools. (8.3%) of respondents strongly agreed, (75.0%) agreed, (16.7%) disagreed and (0.0%) strongly disagreed they encourage students to use ICT tools. Majority (58.3%) of the respondents agreed to the statement that use of ICT tools is useful for learning,

(41.7%) strongly agreed while (0.0%) strongly disagreed and disagreed on the statement. About (33.3%) strongly agreed, (58.3%) agreed while (0.0%) disagreed and strongly disagreed with the statement they feel threatened with the use of ICT tools. Approximately (8.3%), (33.3%) and (58.3%) strongly agreed, agreed and disagreed to the statement they plan for use of ICT tools in their classes while no one who strongly disagreed on the statement. Majority (50.0%) of respondents agreed to the statement that use of ICT tools is critical for improvement of learning achievement, (33.3%) strongly agreed, (16.7%) disagreed while (0.0%) strongly disagreed to the statement. About (8.3%) of respondents strongly agreed and strongly disagreed to the statement they encourage students to use the internet for information searching, (83.3%) agreed while (0.0%) disagreed to the statement. (50.0%) of respondents, (33.3%) disagreed, (16.7%) agreed and (0.0%) disagreed that use ICT tools in class is very frustrating. Equal number (8.3%) of respondents agreed and strongly agreed that they are incapable of operating ICT tools independently while (50.0%) disagreed and (33.3%) strongly disagreed to the statement. Majority (75.0%) of respondents disagreed to the statement they feel inadequate in using ICT tools in class, about (16.7%) strongly disagreed, (8.3%) agreed while (0.0%) strongly disagreed to the statement.

There is no statistical significant connection between the categorical variables since the Cramer's V is 0.098 approximately 0.1 (Small effect), hence teachers' attitude on ICT integration has a small effect size in this study.

## 4.9 Teacher Experience and ICT Integration

The teaching experience of the sampled teachers from each of the schools was viewed a vital variable as it had an impact on the teachers' use of ICT in teaching and learning. The findings are as shown in the following section.

### 4.9.1 Teaching Experience

The findings of the teaching experience were recorded in Table 4.11

**Table 4.11: Years of Teaching Experience**

	Frequency	Percent	Valid Percent	Cumulative Percent
15-24 years	4	33.3	33.3	33.3
10-14 years	1	8.3	8.3	41.7
less than 10 years	7	58.3	58.3	100.0
Total	12	100.0	100.0	

From the findings, (58.3%) of the teachers had experience of less than 10 years in teaching, (33.3%) of teachers had experience in teaching between 15-24 years, those with experience of 10-14 years were (8.3%) and there were no teachers with an experience of more than 24 years. The distribution of teachers experience in teaching suits integration of ICT in learning since majority of teachers are young, fresh, graduate teachers with less than 10 years of work experience who can understand computer operations within a short span of time than the aged teachers who are less. This implies age can influence ICT deployed in schools.

### 4.10 ICT in Teaching

The study also explored the utilization of ICT in teaching. These meant the ICT tools teachers have been using teaching and learning. Table 4.12

**Table 4.12: Use of ICT in Teaching Subjects**

Statement	Strongly agree	Agree	Disagree	Strongly disagree
I use word processing in preparation of lesson plans	1 (8.3%)	4 (33.3%)	6 (50.0%)	1 (8.3%)
I use ICT in preparing lesson notes	3 (25.0%)	4 (33.3%)	5 (41.7%)	0 (0.0%)
I use word processing in preparation of students' worksheets	0 (0.0%)	3 (25.0%)	7 (58.3%)	1 (8.3%)
I use spreadsheets in analysis of students marks	0 (0.0%)	4 (33.3%)	7 (58.3%)	1 (8.3%)
I use database in storage of students records	1 (8.3%)	4 (33.3%)	6 (50.0%)	0 (0.0%)
I use power point presentations for classroom instructions	1 (8.3%)	2 (16.7%)	8 (66.7%)	1 (8.3%)
I use ICT tools to support teaching my subjects	1 (8.3%)	7 (58.3%)	3 (25.0%)	1 (8.3%)
I use ICT for monitoring students' progress and evaluating learning outcomes	1 (8.3%)	4 (33.3%)	5 (41.7%)	2 (16.7%)
I use internet to find and access educational materials	3 (25.0%)	7 (58.3%)	2 (16.7%)	0 (0.0%)
I use ICT for collaboration with other teachers	1 (8.3%)	6 (50.0%)	5 (41.7%)	0 (0.0%)
I use ICT for preparing reports	1 (8.3%)	3 (25.0%)	7 (58.3%)	1 (8.3%)
I prepare lessons that involve the use of ICT by learners	0 (0.0%)	4 (33.3%)	6 (50.0%)	1 (8.3%)
I use ICT for keeping track of students performance	1 (8.3%)	4 (33.3%)	5 (41.7%)	1 (8.3%)

N = 12

Approximately (8.3%) of respondent strongly agreed and also strongly disagreed to the statement, I use word processor in preparing lesson plans while (33.3%) agreed and (50.0%) disagreed to the statement. Majority (41.7%) disagreed, (33.3%) agreed, (25.0%) strongly agreed and (0.0%) strongly disagreed to the statement I use ICT in preparing lesson plans. (0.0%) strongly agreed, (25.0%) agreed, (58.3%) disagreed and (8.3%) strongly disagreed that I use word processing in preparation of students' worksheets. Majority (58.3%) of respondents disagreed to the statement I use spreadsheets in analysis of students' marks, about (33.3%) agreed, (8.3%) strongly disagreed and (0.0%) strongly agreed to the statement. (8.3%) of respondent strongly agreed, (33.3%) agreed, (50.0%)

disagreed and (0.0%) strongly disagreed to the statement I use database in storage of students records. Majority (66.7%) of respondents disagreed, (8.3%) strongly agreed and also strongly disagreed to the statement I use power point presentations for classroom instructions and (16.7%) agreed to the statement. About (8.3%) of respondents strongly and also strongly disagreed that I use ICT tools to support teaching my subjects, with also (25.0%) disagreeing and (58.3%) agreeing to the statement. Majority (58.3%) of respondents agreed, (25.0%) strongly agreed, (16.7%) disagreed and (0.0%) strongly disagreed to the statement I use internet to find and access educational materials. (8.3%) strongly agreed, (50.0%) agreed, (41.7%) disagreed and (0.0%) strongly disagreed that I use ICT for collaboration with other teachers. (8.3%) of respondents strongly agreed and also strongly disagreed to the statement I use ICT for preparing reports while (58.3%) disagreed and (25.0%) agreed to the statement. Approximately (50.0%) of respondents disagreed to the statement I prepare exercises that require the use of ICT by learners, (33.3%) agreed, (8.3%) strongly disagreed and (0.0%) strongly agreed to the statement. At last about (8.3%) of respondents strongly agreed and also strongly disagreed to the statement that I use ICT for keeping track of students' performance while only (33.3%) who agreed and (41.7%) who disagreed to the statement.

#### **4.11 Teaching experience**

The duration of years in teaching for teachers were recorded in table 4.13.



**Table 4.13: Number of years in teaching profession**

	Frequency	Percent	Valid Percent	Cumulative Percent
Less than 10 years	8	66.7	66.7	66.7
11-20 years	1	8.3	8.3	75.0
21-30 years	2	16.7	16.7	91.7
31-40 years	1	8.3	8.3	100.0
Total	12	100.0	100.0	

***Symmetric Measures***

		Value <sup>c</sup>	Approx. Sig.
Nominal by Nominal	Phi	0.491	0.526
	Cramer's V	0.491	0.526
N of Valid Cases		12	

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Large percentage of teachers (66.7%) have been in teaching profession for less than 10 years, (8.3%) between 11-20 years and also 31-40 years while (16.7%) between 21-30 years. This indicates that most of teachers are young teachers who can learn computer within a short period of time since they are exposed to technology. This makes it smooth for students to learn computer from teachers who are conversant with new technology.

The Cramer's V value is approximately 0.500 which concludes that, teaching experience has a large effect size on ICT integration.

**4.11.1 Time to use Computers**

Respondents were asked to state when they first and last used computers. The outcomes are presented in Table 4.14 and 4.15 respectively.

**Table 4.14: First time to use computers in teaching**

	Frequency	Percent	Valid Percent	Cumulative Percent
Less than 10 years ago	9	75.0	75.0	75.0
11-20 years	2	16.7	16.7	91.7
Not at all	1	8.3	8.3	100.0
Total	12	100.0	100.0	

**Table 4.15: When was your last time to use computers in teaching?**

	Frequency	Percent	Valid Percent	Cumulative Percent
Less than 10 years ago	10	83.3	83.3	83.3
11-20 years	1	8.3	8.3	91.7
Not at all	1	8.3	8.3	100.0
Total	12	100.0	100.0	

From the findings on when was the last time for teachers to use computer in teaching, majority (83.3%) said that they had used less than 10years ago, (8.3%) said they had used between 11-20 years and also others never used computers in teaching. This depicts that, there has been use of computers in teaching in secondary schools and most of students and teachers have been involved in applying ICT instruments in teaching and learning.

#### **4.12 Influence of Teachers' Age on ICT integration in teaching and learning**

The respondents were asked to state whether their age influenced ICT integration in teaching and learning. The findings are presented in the next section.

##### **4.12.1 Teachers age and ICT integration**

In regards to teacher's age and its relationship to ICT integration in teaching and learning, the results are recorded in Table 4.16.

**Table 4.16: Influence of teachers' age on ICT integration in teaching and learning**

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	6	50.0	50.0	50.0
No	5	41.7	41.7	91.7
Not sure	1	8.3	8.3	100.0
Total	12	100.0	100.0	

From the findings in table 20, majority (50.0%) said teachers' age influences ICT integration in teaching-learning process, moderate number (41.7%) didn't agree to the statement while (8.3%) were not sure of whether age influence ICT incorporation. From the table it is clear that young and aged cannot be rated the same in using computers to teach.

#### 4.12.2 Internet Access

The respondents were asked to state whether they accessed internet in the process of teaching. The findings are recorded in Table 4.17.

**Table 4.17: Access to internet**

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	8	66.7	66.7	66.7
No	1	8.3	8.3	75.0
Sometimes	3	25.0	25.0	100.0
Total	12	100.0	100.0	

From the table high percentage (66.7%) access internet, (8.3%) they don't access internet, while (25.0%) access internet sometimes. This is clear implication that ICT integration can be possible since many are able to access internet.

### 4.12.3 Frequency of Accessing Internet

Table 4.18 indicates the outcomes of frequency of browsing internet.

**Table 4.18: Frequency of browsing internet**

	Frequency	Percent	Valid Percent	Cumulative Percent
Less than 1 hour per day	7	58.3	58.3	58.3
2-4 hours per day	5	41.7	41.7	100.0
Total	12	100.0	100.0	

Majority (58.3%) use internet for less than 1 hour per day to browse, (41.7%) use internet for about 2-4 hours per day and none of respondent use internet more than that to browse or no one who does not use internet to browse.

### 4.13 Management Support for Teachers in ICT

Respondents were asked to state the support they received from management with regards to ICT integration in teaching and learning. Table 4.19 depicts the results.

**Table 4.19: Management support for teachers in ICT**

Statement	Strongly agree	Agree	Disagree	Strongly disagree
In this school, ICT tools in teaching and learning is encouraged by management	1 (50.0%)	1 (50.0%)	0 (0.0%)	0 (0.0%)
In this school, I get technical support from management while using ICT tools	1 (50.0%)	1 (50.0%)	0 (0.0%)	0 (0.0%)
My school management has put support strategies for teachers to use ICT tools in teaching	0 (0.0%)	1 (50.0%)	1 (50.0%)	0 (0.0%)
In this school, management encourages teachers to participate in learning opportunities in ICT	1 (50.0%)	0 (0.0%)	0 (0.0%)	1 (50.0%)
In this school, management supports teachers to participate in learning opportunities in ICT	0 (0.0%)	1 (50.0%)	1 (50.0%)	0 (0.0%)
In this school, ICT materials are provided for use in the classroom	1 (50.0%)	1 (50.0%)	0 (0.0%)	0 (0.0%)
In this school, ICT equipment and materials are accessible when I need to use them in my lesson	1 (50.0%)	1 (50.0%)	0 (0.0%)	0 (0.0%)

N = 2

From the findings above, (50.0%) strongly agreed and also agreed to the statement, ICT tools in teaching and learning is encouraged by management and (0.0%) disagreed and also strongly disagreed to the statement. (50.0%) strongly agreed and also agreed to the statement, I get technical support from management while using ICT tools while (0.0%) disagreed and also strongly disagreed to the statement. About (50.0%) of respondents agreed and also disagreed to the statement that My school management has put support strategies for teachers to use ICT tools in teaching with (0.0%) who strongly agreed and also strongly disagreed to the same. Approximately (50.0%) of respondents strongly agreed and also strongly disagreed that management encourages teachers to participate in learning opportunities in ICT and (0.0%) didn't agree or disagree to the statement. Equal (50.0%) of respondents agreed and also disagreed that, management supports teachers to participate in learning opportunities in ICT while (0.0%) didn't strongly agree or strongly disagree to the statement. Approximately (50.0%) of respondents strongly agreed and also agreed to the statement ICT materials are provided for use in the classroom while (0.0%) disagreed and also strongly disagreed to the statement. From the findings (50.0%) of respondents strongly agreed and also agreed to the statement ICT equipment and materials are accessible when I need to use them in my lesson while (0.0%) disagreed and also strongly disagreed to the statement.

## **CHAPTER FIVE**

### **SUMMARY OF FINDINGS, DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS**

#### **5.1 Introduction**

This chapter summarizes the study, implication of the findings, conclusions, discussions, recommendation for policy and practice and recommendations for further study.

#### **5.2 Summary of Findings**

The goal of this study is to determine the factors that influence the integration of ICT in secondary schools in Matungulu sub county, Machakos County. The objectives of the study were; to determine the influence of infrastructure availability and accessibility on the integration of ICT in secondary schools, to assess how teachers' ICT competence influences the integration of ICT in secondary schools, to examine the influence of teacher's attitude on the integration of ICT in secondary schools and to evaluate the extent in which teachers' teaching experience influences integration of ICT in education in secondary schools.

##### **5.2.1 Infrastructure and ICT Integration**

The first objective was meant to determine the influence of infrastructure availability and accessibility on the merging of ICT in secondary schools programs. The study found that majority of the respondents, their level of expertise in computer use were fairly able to operate computer (30.5%), (25.3%) were rated good to operate a computer, (17.4%) were excellent in operating, (14.9%) were rated very good in operating while those who had no expertise in operating a computer were least with (11.9%). This implies that many were

conversant with use of ICT tools since only 11.9% out of 100% who cannot operate a computer.

### **5.2.2 Teachers' ICT Competence and ICT Integration**

The second objective strived to establish the degree to which teacher' ICT competency influence integration of ICT in teaching and learning. The study found that majority (58.3%) of respondents agreed to the statement use of word processing and spreadsheets in preparation of lesson, (33.3%) disagreed, (8.3%) strongly disagreed and (0.0%) strongly agreed to the statement. Only (8.3%) of respondents strongly agreed, (58.3%) agreed and (16.7%) disagreed and also strongly disagreed to the use of spreadsheets in analysis of students marks. (8.3%) of respondents strongly agreed and strongly disagreed to use of database in storage of students records, (50.0%) agreed while (25.0%) disagreed to the statement. (8.3%) of respondents strongly agreed, (41.7%) agreed, (50.0%) disagreed and (0.0%) strongly disagreed to use of power point presentations for classroom. Majority (41.7%) agreed to statement how to operate and maintain computers, (33.3%) disagreed, (16.7%) strongly agreed while (0.0%) strongly disagreed to the statement. (16.7%) strongly agreed, (50.0%) agreed, (33.3%) disagreed and (0.0%) strongly disagreed to the statement assist students to access learning materials. Approximately (16.7%) of respondents strongly agreed to the statement assess students learning, (50.0%) agreed, (25.0%) disagreed while (8.3%) strongly disagreed to the statement. Majority (50.0%) agreed, (25.0%) strongly agreed and (8.3%) disagreed and also strongly disagreed to the statement collaborate with other teachers.

### 5.2.3 Teacher's Attitude and ICT Integration

The third objective was to examine the influence of teacher's attitude on the integration of ICT in secondary schools. The study found out that, (25.0%) of respondents agreed, (66.7%) disagreed, (8.3%) strongly disagreed and (0.0%) strongly agreed that ICT tools are difficult to use. (25.0%) strongly agreed, (66.7%) agreed, (8.3%) disagreed and (0.0%) strongly disagreed that working using ICT tools is comfortable. (33.3%) of respondents strongly agreed, (66.7%) agreed while (0.0%) disagreed and also strongly disagreed that they could be better teacher with ICT tools. (8.2%) strongly agreed, (16.7%) agreed, (58.3%) disagreed and (16.7%) strongly disagreed that they see ICT tools as sometimes they will rarely use in their teaching. (58.3%) strongly agreed, (41.7%) agreed and (0.0%) disagreed and also strongly disagreed that use of ICT tools in teaching can improve performance. (75.0%) strongly agreed, (25.0%) agreed and (0.0%) strongly disagreed and also disagreed using ICT tools for teaching would be enjoyable and stimulating. About (25.0%) and (75.0%) disagreed and strongly disagreed respectively while (0.0%) strongly disagreed and agreed that ICT tools are not relevant in teaching. Approximately (58.3%) agreed and (41.7%) disagreed while (0.0%) strongly disagreed and strongly agreed that they always try out some learning activities with ICT tools. (8.3%) of respondents strongly agreed, (75.0%) agreed, (16.7%) disagreed and (0.0%) strongly disagreed they encourage students to use ICT tools. Majority (58.3%) of the respondents agreed to the statement that use of ICT tools is useful for learning, (41.7%) strongly agreed while (0.0%) strongly disagreed and disagreed on the statement. About (33.3%) strongly agreed, (58.3%) agreed while (0.0%) disagreed and strongly disagreed with the statement they feel threatened with the use of ICT tools.



Approximately (8.3%), (33.3%) and (58.3%) strongly agreed, agreed and disagreed to the statement they plan for use of ICT tools in their lessons while no one who strongly disagreed on the statement. There is no statistical noticeable linkage between the categorical variables since the Cramer's V is 0.098 approximately 0.1 (Small effect), hence teachers' attitude on ICT integration has a small effect size in this study.

#### **5.2.4 Teaching Experience and its Influences on ICT Integration**

The fourth objective was to assess the degree to which teachers' teaching experience influences integration of ICT in education in secondary schools. The study found out that, (58.3%) of the teachers had experience of less than 10 years in teaching, (33.3%) of teachers had experience in teaching between 15-24 years, those with experience of 10-14 years were (8.3%) and there were no teachers with an experience of more than 24 years.

#### **5.4 Discussion**

In comparison of this research to other researches, from the objective on determining the influence of infrastructure availability and accessibility on the integration of ICT in secondary schools, it is evident that to integrate ICT in teaching and learning there should be enough facilities like computers, teachers etc. This concurs with the findings by Law et al. (2000) that in order to have a teaching learning process or education system supported by technology, the availability of suitable infrastructure is essential. This means that it is very challenging to focus on implementation of technology to support learning unless schools are supplied with basic technological infrastructure and facilities. According to Newhouse, (2002), many teachers without skills and knowledge are not enthusiastic about integration of ICT in their teaching activities. From this research it was

found that teachers' competence is very crucial in the integration of ICT in secondary school to avoid poor delivery of information in class time.

Teachers attitude on ICT integration was found to have no large effect in the study in affecting combination of ICT in learning and teaching, this is contrary to the study by Van Braak et al. (2004) it was found that teachers' attitude on the integration of ICT is very important. Lastly, teaching experience has an effect in the integration of ICT in learning and teaching. This can be supported by the study by Mulwa and Kimosop (2015) who found that the duration of service for teachers in teaching profession influences the utilization of ICT in daily classroom activities.

### **5.3 Conclusions**

Emanating from the findings of the study, it can be concluded that both principals and teachers had been trained in basic computer literacy at certificate level and had no ICT training in their subject areas. This means they have limited in ICT competencies, and therefore it can be concluded that there is need for in depth training of teachers in ICT in the respective subject specializations in order to develop the competency and confidence required to merge ICT in teaching and learning. Thus, ICT Competence has significance correlation on other factors in ICT integration in teaching and learning.

The findings depicts that ICT integration in teaching and learning has not been embraced in most public secondary schools in Matungulu Sub County. There is also low usage of ICT technology such as internet, television, computers, LCD and overhead projectors in teaching and learning. In addition the researcher found that principals and teachers used computers frequently for personal needs but didn't use them for teaching and learning.

The researcher thus established that the government policy on integration of ICT in teaching and learning hasn't been fully effected in secondary schools in Matungulu Sub County. The researcher established that the greatest obstacles to ICT integration in teaching and learning were poor quality of training and lack of skills on the part of the teachers and principals.

The findings on the availability of ICT facilities and infrastructure in schools indicates that there are computer laboratories in schools but the computers and other facilities are insufficient. It is therefore mandatory for principals to provide enough computers and other facilities for their schools for utilize in teaching and learning. This would help in improving the quality of teaching and learning. Based on the findings of the study it can be concluded that teacher's attitudes doesn't influence integration of ICT in teaching and learning in public secondary schools in Matungulu Sub County. However, the teacher's attitude is a major predictor of the acceptance and actual utilization of computers in the classrooms and in the management of their work. It is therefore very important for teachers to instil a positive attitude towards ICT as their attitude influences other factors that influence its integration in the teaching and learning process.

## **5.5 Recommendations**

Based on the study finding, the researcher makes several recommendations;

- a) The Ministry of Education must ensure that all teachers are trained in ICT skills that are pertinent for ICT integration in teaching and learning.
- b) The universities should ensure its compulsory for all students training as teachers to take a compulsory unit on computer studies. The academic professional training that

- teachers and principals undergo should be evaluated if it is adequately meeting the threshold to promote the use and integration of ICT in public secondary schools.
- c) The government should also increase its computers allocation to schools and make it mandatory for all schools to integrate ICT in the management assignments as well as construct computer laboratories in all schools. This will enable most schools acquire computers which will be used for ICT integration in management of the schools.
  - d) All the schools should have internet connectivity to enable principals and teachers to use ICT in the schools. This would help in communication as well as academic research.
  - e) The schools should also have alternative source of power in places where there is no electricity so as to enable effective ICT integration in school management.
  - f) The Teachers Service Commission should peg future recruitment and promotions of teachers to those who have undergone ICT training for e-learning and ability to integrate ICT into their duties of management.
  - g) There is need for schools with ICT facilities to address the issue of lack of ICT staff as this will ensure that the facilities are in good working conditions and are utilized responsibly and optimally by the students and staff.
  - h) All the students should be equipped with some basic training on the use of computers before selecting computer studies as a specialized course.
  - i) The students should be guided on responsible use of ICT facilities to ensure that there is no addiction to the use of computers at the expense of engaging in other non-important activities such as computer games.

- j) The culture of use of computer facilities should be encouraged in school so as to nurture the skills possessed by some of the teachers and the students. This can be achieved by encouraging the use of power point during school meetings. The teachers should also be encouraged to type their own work instead of depending on the secretary.

## **5.6 Recommendations for Further Research**

In this study a number of issues could not be comprehensively covered because of a wide range of limitations hence the following areas were identified for further study.

- i. A related study to be carried out in the private secondary schools and also in middle level colleges.
- ii. This study to be undertaken on a different geographical area in Kenya.
- iii. The researcher recommends that further research can be undertaken to establish the extent of ICT integration in other areas like in management of resources and finances at the school level.
- iv. A study can also be done to investigate the impact of the application of Information Communication Technology on the academic performance of public secondary schools in Kenya.
- v. Studies can also be done to investigate the part of parents, teachers and sponsors in advocacy of use and incorporation of ICT in management of public secondary schools.
- vi. A study on the strategies for effective and efficient utilization of ICT in public secondary school.

- vii. Bridging of a gap between the ICT Policy creation and the policy implementation in order to focus on strategies for policy implementation.
- viii. To establish other variables that influence the integration of ICT in teaching and learning such as economic ,social and geographical factors and examine their impact on ICT integration in teaching and learning.

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## APPENDICES

### Appendix I: Letter of Transmittal

James K. Kanyoi  
School of Continuing and Distance Education  
19<sup>th</sup> March 2018  
To  
The Principal,

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#### REQUEST TO CARRY OUT RESEARCH

I am a postgraduate student at the University of Nairobi pursuing a degree of Master of Arts in Project Planning and Management.

One of the requirements of the course is to carry out a research project in a relevant area. I chose to carry out a research on the Factors Affecting the Integration of ICT in Teaching and Learning in Secondary Schools: A Case of Matungulu Sub County, Machakos County.

I kindly request you to allow me to carry out research in your school. Be assured that your identity and response will be treated with utmost confidentiality. For this reason, do not write your name on the questionnaire. The research will involve the office of the principal, Five (5) teachers and eighteen (18) students. Five (5) teachers will be picked at random one from each of the following areas of specialization: Mathematics, languages, sciences, humanities, technical subjects and one computer teacher. The 18 students will be picked from forms 2 and 3 each class contributing nine (9) students.

The data collected will be confidential and will only be used for the purpose of the study.

Thanking you in advance.

Yours faithfully,

James Kanyoi  
L50/83850/2012



**SECTION B: TEACHERS' ATTITUDES ON ICT INTEGRATION**

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

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

No.	Statement	Rating			
		4	3	2	1
6.	ICT tools are difficult to use				
7.	I feel comfortable working with ICT tools like a computer				
8.	I believe that I could be a better teacher with ICT tools				
9.	I see the ICT tools as something I will rarely use in my teaching				
10.	Use of ICT tools in teaching can improve students' performance				
11.	I think that using ICT tools for teaching would be enjoyable and stimulating				
12.	ICT tools are not relevant in teaching				
13.	I always try out some learning activities with ICT tools				
14.	I encourage my students to use ICT tools				
15.	I consider use of ICT tools as useful for learning				
16.	I do not feel threatened with the use of ICT tools				
17.	I plan for use of ICT tools in my lessons				
18.	Use of ICT tools is critical for improvement of learning achievement				
19.	I make efforts to upgrade my skills in use of ICT skills				
20.	I encourage my students to search for information on the Internet				
21.	Use of ICT tools in class is very frustrating				
22.	I am incapable of operating ICT tools independently				

23.	I feel inadequate in using ICT tools in class				
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**SECTION C: TEACHERS' COMPETENCE IN USE OF ICT TOOLS**

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

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

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

**SECTION D: USE OF ICT IN TEACHING SUBJECTS**

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

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

No.	Statement	Rating			
		4	3	2	1
34.	I use word processing in preparation of lesson plans				
35.	I use ICT in preparing lesson notes				



36.	I use word processing in preparation of students' worksheets				
37.	I use spreadsheets in analysis of students marks				
38.	I use databases in storage of students records				
39.	I use PowerPoint presentations for classroom instructions				
40.	I use ICT tools to support teaching my subject				
41.	I use ICT for monitoring students' progress and evaluating learning outcomes				
42.	I use the internet to find and access educational materials				
43.	I use ICT for collaboration with other teachers				
44.	I use ICT for preparing reports				
45.	I prepare lessons that involve the use of ICT by learners				
46.	I use ICT for keeping track of students performance				

#### SECTION D: TEACHING EXPERIENCE

Read each statement carefully and rate by ticking (√) in the table below, Extent to which Teachers' Experience Influence ICT Integration in Teaching-Learning.

47. For how long have you been in teaching profession?

Less than 10 years [ ]

11 – 20 years [ ]

21 – 30 years [ ]

31 – 40 years [ ]

Over 40 years [ ]

48. When was your first time to use computers in teaching?

Less than 10 years [ ]

11 – 20 years ago [ ]

21 – 30 years ago [ ]

Over 31 years ago [ ]

Not at all

**49.** When was your last time to use computers in teaching?

Less than 10 years ago

11 – 20 years ago

21 – 30 years ago

Over 31 years ago

Not at all

**50.** Do you think the teachers' age influences the ICT integration in teaching-learning?

a) YES  b) NO  c) NOT SURE

Briefly explain your answer.....

**51.** Do you have your personal computer? a) YES  b) NO

**52.** If NO, who types your notes for the lesson?

a) Own

b) Cyber Café

c) Others teachers

d) Not typing anything

**53.** If helped in cyber café and by other teachers, then why  
.....?

**54.** For what purpose do you mostly use your computer?

Type notes

Set and type exams

Watch movies

Listen songs

Other Uses (specify): .....

**55.** Do you access internet? a) Yes  b) No  c) Sometimes

**56.** If YES, where? a) School  b) My Home  c) Cyber Café  d) Friends  e) Others  
 (specify).....

**57.** If NO, why? .....

**58.** How frequently do you browse internet?

Less than 1 hour per day

2 – 4 hours per day

- 5 – 6 hours per day
- More than 7 hours a day
- None of the above

- 59.** For what purpose(s) do you browse the internet?  
 .....
- 60.** Apart from computers, which other ICT tools do you use?  
 .....
- 61.** In your opinion, what can be done to improve adoption and use of ICT in curriculum?.....

**SECTION F: MANAGEMENT SUPPORT FOR TEACHERS IN ICT**

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

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

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

No.	Statement	Rating			
		4	3	2	1
62.	In this school, use of ICT tools in teaching and learning is encouraged by management				
63.	In this school, I get technical support from management while using ICT tools				
64.	My school management has put support strategies for teachers to use ICT tools in teaching and learning				
65.	In this school, management encourages teachers to participate in learning opportunities in ICT				
66.	In this school, management supports teachers to participate in learning opportunities in ICT				
67.	In this school, ICT materials are provided for use in the classroom				
68.	In this school, ICT equipment and materials are accessible when I need to use them in my lessons				

End

Thank you for taking time to respond to this questionnaire.

**Appendix III: Principals' Interview Schedule**

This questionnaire is designed to gather data about factors affecting ICT integration in teaching and learning in Matungulu Sub County, Machakos County, Kenya.

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

**PART A**

Background Information

1. Sex

Male  Female

2. What is your highest professional qualification?

Masters' degree  Bachelors' degree  Dip Ed

Other specify.....

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

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

Less than 5 years

**PART B**

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

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

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

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

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

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

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

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Thank you for your time.

## Appendix IV: Students' Questionnaire

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

### PART A: Background information

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

1. Please indicate your gender.

Male  Female

2. Your class

Form 1  Form 2  Form 3  Form 4

3. What is your age bracket?

Below 14 years	<input type="checkbox"/>
15 years	<input type="checkbox"/>
16 years	<input type="checkbox"/>
17 years	<input type="checkbox"/>
Above 17 years	<input type="checkbox"/>

### PART B: Expertise in computer use

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

Level of expertise	Tick the one that applies
No expertise- cannot use computers at all	<input type="checkbox"/>
Fair -able to operate basic computer functions and a word processing application	<input type="checkbox"/>
Good	<input type="checkbox"/>
Very Good	<input type="checkbox"/>
Excellent	<input type="checkbox"/>

### SECTION C: Use of ICT in class by teachers

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

Subject	Computer use in class
English	<input type="checkbox"/>

Any foreign language	
Kiswahili	
Mathematics	
Science	
Computer Studies	
History	
Geography	
Agriculture	
Religious Education	
Home science	
Physical Education	

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

<b>In school I used computers to----</b>	<b>Sometimes</b>	<b>Never</b>
Browse for information on internet		
Play games		
Send email to other people		
Do my homework		
Download music		
Write reports on project work		

Thank you for your time.

**Appendix V: Support Staffs' Interview Schedule**

This questionnaire is designed to gather data about factors affecting ICT integration in teaching and learning in Matungulu Sub County, Machakos County, Kenya.

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

**PART A**

Background Information

1. Gender

Male  Female

2. What is your highest professional qualification?

Diploma  Professional Certificate  Form Four Level   
Standard 8 Level  Other specify.....

3. For how long have you been in this school?

More than 24 years  15-24 years  10-14 years  5-9   
years  
Less than 5 years

**PART B**

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

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5. What do you do in the School?

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6. Do you use computers in your day to day work?

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7. What do you consider as barriers to ICT integration in your school?

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8. What support do you receive from the school in order to integrate ICT in your work?

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9. Averagely, what is the level of expertise in computers in your school?

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---

---

10. Do teachers use ICTs in their work?

---

Has there been any ICT training for staff within the last three years?

---

11. What skills do you think support staff should have in order to integrate ICT in their work?

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End

Thank you for taking time to respond to this questionnaire.

## Appendix VI: Observation Checklist

UNIT OF OBSERVATION	COMMENTS
<b>ICT infrastructure in place</b>  Computer laboratory  Processor speed  Type of monitors in use  State of maintenance	
<b>Access to ICT infrastructure</b>  Access of ICT infrastructure to students  Access of ICT infrastructure to teachers	
<b>Technical support</b>  Availability of technical support	
<b>Use of ICTs to enhance teaching and learning</b>  Teachers use of ICT  Students use of ICT	

**Appendix VII: Krejcie and Morgan Table**

<i>N</i>	<i>S</i>	<i>N</i>	<i>S</i>	<i>N</i>	<i>S</i>
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	100000	384

Note.—*N* is population size.

*S* is sample size.

Source: *Krejcie & Morgan, 1970*